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VALUATION OF CRUDE CARBOLIC ACID.

By Carl E. Smith.

(Report from Research Committee D, Section II., Committee of Revision of the U.S.P.)

The U.S.P. of 1890 characterizes crude carbolic acid as "a liquid consisting of various constituents of coal-tar, chiefly cresol and phenol, obtained by fractional distillation." A test for presence of alkali is given, and another, designed to exclude more than 10 per cent. of the less soluble constituents of coal-tar.

As might be expected, the commercial supplies of this substance vary considerably in composition and strength, the relative proportions of phenol and the cresols, the percentages of so-called tar-oils and of water being particularly subject to variation. Since the cresols have been shown to be about three times more powerful as antiseptics than phenol, it is not a matter of indifference to the consumer whether a product consists chiefly of one or of the others. The non-phenolic constituents of crude carbolic acid, to which the collective name of "tar-oils" has been given, may include hydrocarbons, as naphthalene, anthracene, phenathrene, diphenyl, etc., such bases as pyridine, quinoline, aniline, etc., and other substances still undetermined. Some of these compounds mentioned have undoubted antiseptic value, while others are inert. Water is always found, and, if present in larger quantity than 5 per cent., might be looked upon as an adulteration. With ordinary care in the distillation it will not exceed a fraction of 1 per cent., according to the experience of at least one manufacturing firm within the writer's knowledge.

It has been pointed out by Dr. E. R. Squibb (*Ephemeris*, Vol. I, p. 328) that the solubility test of the Pharmacopœia is impracticable, as it will reject all samples not composed mainly of crystallizable phenol, excluding cresols and xylenols except in small quantities. A sample containing 96 per cent. of the less soluble phenols never came within 16 per cent. of the requirements. This is applied to the test given in the U.S.P. of 1880, which is practically the same as the present one. This latter reads as follows: "If 50 volumes be thoroughly agitated with 950 volumes of water, the undissolved portion should not exceed 5 volumes, or 10 per cent. by volume of the acid." Dr. Squibb proposed the following modification: "Mix 50 volumes of the sample with 1,000 volumes of water in a vessel of 2,000 volumes capacity and shake actively. Allow to separate, pour off the upper milky fluid, add 500 volumes of water to the residue and again skake vigorously and set aside to separate. Again pour off the watery liquid and transfer the residue to a measuring cylinder. The undissolved residue from crude carbolic acid No. 1 should not be more than 5 volumes, from No. 2 not more than 18 volumes, and from the crude carbolic acid of the market not more than 25 volumes."

H. W. Jayne (Am. Jour. Pharm., 1894, p. 119) states that a 60 per cent. acid answered the requirements of the Pharmacopœia, but after distillation, to remove tarry matter and about 11 per cent. of water, showed 30 per cent. insoluble.

It is evident that the solubility test is apt to mislead in several particulars. Intended to exclude inert "tar-oils," it excludes the valuable cresols as well. The presence of a large quantity of water, which may reach 20 per cent. or more without possible detection by the official tests, will correspondingly increase the solubility of the acid in water, vitiating the test completely.

A fractional distillation will, of course, give quite serviceable results in approximately indicating the quantities of phenol, cresols, xylenols and water present, and supersaturation with caustic soda solution and extraction with ether will serve as a rough estimation of bases and hydrocarbons. But these methods are too tedious and time-consuming for the use of the pharmacist, who is in need of methods requiring little time and attention.

Dr. Charles Rice, at whose request the writer took up this subject, suggested that Koppeschaar's bromine solution might possibly

be made serviceable here, with proper precaution, to show the proportions of the several phenols by their differences in bromine absorption. To determine with accuracy by this method the proportion of phenol and cresols in mixtures, the following conditions must be fulfilled: The mixture must be either free from all substances other than phenol and the cresols, or they must be present in known quantities and their weight deducted from the weight of the sample taken. The mixture must contain no other substances that bind bromine, or it must contain them in known quantity, in which case the amount of bromine they will take up must be known. The contaminating substances must not in any other way interfere with the reaction.

To make the method applicable to crude carbolic acid, ready means for determining the non-phenolic bodies present would be required, and it appeared from an examination of the literature on the subject, that simple and satisfactory methods for this purpose were available, but experience with them soon showed them to be wanting in accuracy.

For the estimation of water, it is usually directed to shake a known volume of the acid with a saturated solution of sodium chloride, on the assumption that the diminution in the volume of the acid, after agitation and perfect separation, is equivalent to the volume of water present. This the writer found far from being the case. A sample of acid, consisting of about equal parts of phenol and the cresols, and conforming to the pharmacopœial requirements, was, on distillation, found to contain about 0·5 per cent. of water. The same sample, on being shaken with an equal volume of the salt solution, should have decreased slightly in volume, but instead, it was found to *increase* 9·5 per cent., with a simultaneous separation of sodium chloride crystals. When sufficient water was added to the sample to make the mixture contain 5 per cent., and tested in the same manner, it increased 4 per cent. in volume. With 10 per cent. of water it decreased 6·5 per cent., showing two-thirds of the water present. With 19·5 per cent., a saturated solution of water in the acid at about 25° C., 15·5 per cent. was indicated. These results show the test to be entirely worthless for detecting or estimating moderate quantities of water, at least in samples containing much phenol. But the error is lessened as the proportion of water increases. Acids, consisting mainly of

cresols, give better results. A sample of this kind, from which 3·9 per cent. of water could be separated by distillation, gained 1·5 per cent. on shaking with salt solution. Saturated with water, so as to contain 12·3 per cent., it tested about 8 per cent. Similar results were obtained with commercial "crude cresol." A saturated solution of calcium chloride was tried at the suggestion of Professor Coblentz, but was found to have no advantage over the solution. Separation of the liquids after agitation was also slower, because of the greater density of the solution. Distillation seems to be the only practical method of estimating water, and even this cannot be said to be very exact, since the water that distils over contains considerable quantities of phenol, and the phenol, which comes over with the water and collects on the bottom of the receiver, no doubt contains water. There is also a small loss of water by vaporization.

Another difficulty lies in the estimation of non-phenols other than water. In Allen's "Commercial Organic Analysis," the following method is given for the rough estimation of "tar-oils": "Place 10 c.c. in a graduated tube, and gradually add 20 c.c. of a 9 per cent. solution of caustic soda (free from alumina). Close and agitate. Neutral oils form a layer above or below, after separating. To make separation more rapid and complete, add a known volume of petroleum spirit." In applying this method to three specimens of varying composition, the writer was unsuccessful. In each case the mixture of acid and soda was perfectly clear and the petroleum spirit, though acquiring a dark color, did not sensibly increase in volume. By extracting the alkaline mixtures with ether, the samples yielded respectively about 1, 4 and 5 per cent. of hydrocarbons, bases, etc., after spontaneous evaporation of the ether.

Muter and De Koningh (*Analyst*, Vol. 12, p. 191) estimate tar-oils by agitating 20 c.c. of the acid with 80 c.c. of 5 per cent. caustic soda solution and 5 to 10 c.c. of benzol. A dark layer which forms under the 100 c.c. mark represents the amount of tar-oils in the sample. This was tried with two samples known to contain at least 4 to 5 per cent. of tar-oils, but in neither case was a dark layer formed between the alkaline solution and the benzol. With one sample the benzol increased in volume, but an emulsion, at the zone of contact, which did not break up after twenty-four hours, made a reading impossible. With the other sample the benzol apparently

diminished in volume slightly, a small amount remaining permanently in suspension in the aqueous liquid, with a portion of the precipitated impurities from the acid.

Various changes in the details of both procedures were tried without success. It seems likely that at the time they were devised crude carbolic acid was quite different in composition from that now met with. The writer gives preference to the following expedient, but realizes that it is far from accurate, the results probably being always too low: mix 10 grammes (or 10 c.c.) of the sample with 50 c.c. of 5 per cent. caustic soda solution in a separator. Add to the mixture, after cooling to room temperature, 15 c.c. of ether, and shake actively for a few minutes, then put it aside to separate. Draw off the aqueous liquid and transfer the ethereal solution to a weighed porcelain dish. Extract the alkaline solution with two additional portions of 10 c.c. each, of ether, and add these to the contents of the dish. Allow the ether to evaporate spontaneously and weigh the residue, which represents the tar-oils in the sample. As nearly all of these are more or less volatile at ordinary temperatures, a considerable proportion of them is probably lost before all ether is vaporized, and since the amounts of the more volatile constituents vary, it is difficult to estimate this loss. In a warm and humid atmosphere, water condenses in the dish during evaporation of the ether, and additional time must be allowed in such cases for the evaporation of this water before weighing, which entails an additional loss of the oils. Under any circumstances the percentage of tar-oils obtained by this or other available means must be accepted with considerable reservation.

The uncertainty in the estimation of those constituents of crude carbolic acid not phenols, would render Koppeschaar's Bromine Method inapplicable to the determination of the ratio of phenol and cresols, even if there were no other objections, but there are two other reasons, which alone would be sufficient to reject it. One is the fact that crude carbolic acid nearly always contains still higher homologues of the phenol series than the cresols, each group of isomers combining with bromine in a different ratio. The other reason is that some of the impurities in the acid also form substitution compounds of bromine under the conditions of the assay, as the writer determined by experiment. The tar-oils obtained from two samples by extraction with ether were found in one case to require

6·7 c.c. of decinormal bromine solution for 0·1 gramme of oil, and in the other 6·4 c.c., which is approximately one-tenth as much bromine as is required by the same quantity of pure phenol. One of the samples yielded four times as much to ether as the other, and also in other respects showed great difference in composition; it therefore seems remarkable that there was no greater difference in the bromine absorption of the two ether extracts. It is, however, subject to too much variation to permit the adoption of a constant correction factor.

Two samples of crude carbolic acid were distilled and different fractions of the distillate examined separately. The results are given in the following tables:

SAMPLE I.

Fraction.	Distillate, per cent.	C.c. $\frac{N}{10}$ Bromine Solution required by 0·01 gramme.
98°–180°	1 {Water, 0·5 p. c. Phenol, etc., 0·5 p. c.	
180°–185° (mostly 183°–184°)	34	5·75 white, bulky precipitate.
185°–190°	46	5·6 " " "
190°–195°	13	5·35 brown-yellow, compact precipitate.
195°–200°	4	5·15 " " " "
Residue	2	4·65 " " "

The crude acid itself required 5·46 c.c. of decinormal bromine solution for 0·01 gramme of sample. Assuming the proportions of phenol and cresols to be about equal, as indicated by the boiling points, this would be equivalent to approximately 93 per cent. of total phenols. The hydrocarbons, bases, etc., extracted with ether, amounted to 1·05 per cent., and water, separated by distillation, 0·5 per cent. This still leaves 5·5 per cent. unaccounted for. Partial loss of the ether extract through volatilization does not explain this great discrepancy, but it seems probable that crude carbolic acid may contain a considerable quantity of other acids, which ether would not extract from an alkaline solution. Similar, and even greater, discrepancies were noticed in the examination of two other less pure samples.

SAMPLE II.

Fraction.	Distillate, per cent.	C.c. $\frac{N}{10}$ Bromine Solution required by 0·01 gramme.
95°–195°	3·6 { Water, 2·8 p. c. Phenols, etc., ·8 p.c	
195°–197·5°	51	5·15
197·5°–200°	25	4·8
200°–205°	14	4·5
Residue	6	3·8

The sample was labelled "crude cresol" and had a dark red-brown color. It required 4·68 c.c. of decinormal bromine solution, for 0·01 gramme, which is equivalent to 85 per cent. of cresols, applying the factor for cresols also to other phenols which may be present in small amount. The ether extract was 4·65 per cent. and the water separated by distillation 2·8 per cent., making a total of 92·5 per cent. The remainder is unaccounted for.

A third sample required 4·73 c.c. of the bromine solution for 0·01 gramme, corresponding to about 85 per cent. of cresols, etc. Distillation separated 4 per cent. of water and 4·2 per cent. was extracted from the alkaline mixture with ether. As only 1·5 per cent. of phenols passed over below 190° in distilling the water, it was concluded that the sample contained little or no phenol, as the latter boils at 182°, and the cresols between 190° and 200°. This sample also contains 7 per cent. of constituents, that are left undetermined for the present.

It was at first suspected that these discrepancies might have been caused by an error in the strength of the bromine solution. It was therefore re-standardized and found correct. After titration against carefully purified sodium thiosulphate, the solution was used in an assay of the purest phenol obtainable, indicating 98·9, 99·3 and 98·5 per cent. of phenol. The sample melted at 40·5°, the melting-point required for absolute phenol being 42·5°, and the result of assay thus being corroborated. Titration of the crude acids being performed under the same conditions, as nearly possible, insured accuracy of the results.

While it is not yet practicable to accurately determine the quantities of phenol and cresol in the complex mixtures containing them by the bromine method, this method is, nevertheless, in the

writer's judgment, better suited than any other single test, to indicate approximately the value of a sample of crude carbolic acid, and it furnishes information that cannot be obtained by the methods in general use, or by a fractional distillation. It may also be safely assumed that its results will be less liable to wrong interpretation. The bromine consumed by a definite amount of the sample and the character of the precipitate formed will give a very fair indication of quality and strength. Tri-brom-phenol separates in the assay as a very voluminous, white, flocculent precipitate, leaving the solution perfectly clear. The tri-brom-cresols separate imperfectly, a large proportion remaining suspended, forming a liquid of milky appearance. A portion of the precipitate settles to the bottom in form of small brownish-yellow globules, which occupy very little space as compared with the precipitate from the same quantity of phenol. It is easy thus to determine whether a sample in hand consists mainly of cresols or of phenol, without determining the boiling-points. After making control-experiments with mixtures of known quantities of phenol and cresol, it is possible to estimate approximately their relative quantities in samples of unknown composition. It was found, however, that the appearance of the precipitate of the one substance is but little changed by the presence of the other in quantities less than-fourth.

As the Pharmacopœia places no restriction on the proportions of phenol and the cresols, but merely requires the absence of more than 10 per cent. of the "less soluble constituents of coal tar," it may be assumed that a standard of not less than 90 per cent. of the phenol series was intended, irrespective of the relative quantities of these. The possible presence of large quantities of water was evidently lost sight of, and as this may be legitimately present up to 5 per cent., it would seem that a further allowance to that extent should be made in interpreting the pharmacopœial intentions, making a requirement of at least 85 per cent. of phenols. The quantity of volumetric bromine solution required for a given weight of an 85 per cent. acid must necessarily vary with the proportions of the different phenols, as their combining weights for bromine differ, and it is therefore hardly practicable to set an arbitrary limit of the volume of decinormal bromine solution that a definite weight of an 85 per cent. acid shall require. It will be necessary to judge from the character of the precipitate the approximate ratio of phenol and

cresols and calculate from the volume of bromine solution consumed their approximate percentages.

The writer recommends to proceed in the assay as follows: Place 1 gramme of the sample into a graduated 100 c.c. flask, nearly fill with water and shake briskly for a few minutes. Then fill to the mark with water and mix thoroughly. Measure 2 c.c. (= 0·02 gramme of the sample) into a glass-stoppered 100 c.c. flask, excluding undissolved matter, by filtration, if necessary. Add 10 c.c. of water, 12 c.c. of decinormal bromine solution and 2 c.c. of hydrochloric acid. Stopper at once securely and shake the mixture occasionally during a half hour. Then add 2 c.c. of potassium iodide test-solution in such a manner as to avoid loss of bromine vapor and quickly re-insert the stopper. Shake thoroughly and add decinormal thiosulphate solution until the solution is decolorized. If the sample contains cresols in considerable quantity, the solution will become yellow again after standing a short time, probably due to the gradual breaking up of an addition-product of tri-brom-cresol and bromine or iodine. This may be hastened by active shaking after each addition of thiosulphate to the decolorizing point, and must be continued until the solution remains colorless after prolonged shaking. The number of cubic centimeters required, deducted from 12, gives the number of cubic centimeters of decinormal bromine solution consumed by 0·02 gramme of the sample.

The following short table will assist in calculating the result of the titration. It gives the volume of decinormal bromine solution required for 0·02 gramme of samples containing 85 per cent. of phenol and cresols, in different ratios, and 10 per cent. of tar-oils, the bromine absorbed by these being included:

Chiefly phenol	11·0 c.c.
Phenol, ¾; cresol, ¼	10·65 "
" ½; " ½	10·3 "
" ¼; " ¾	9·95 "
Chiefly cresol	9·6 "

The quantity of the still higer homologues of the phenols likely to be present is usually too small to make it necessary to consider them in the calculations for such rough estimations.

An example will best illustrate the calculation of results. The appearance of the precipitate indicates phenol and cresols to be present in about equal quantities, and 10·7 c.c. of decinormal bromine

solution is required. According to the table, an 85 per cent. acid would have required 10.3 c.c., so a simple proportion is all that is required.

$$10{\cdot}3 : 10{\cdot}7 :: 85 : x ; x = 88 \text{ per cent.}$$

This quantitative bromine test as a substitute for the present pharmacopœial solubility test, and the test for alkali are all that is required to arrive at the value of a sample for disinfecting purposes. No other information of any value can be obtained short of a fractional distillation.

PHARMACEUTICAL LABORATORY OF THE
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STRUCTURE OF GELSEMIUM.

BY JOSEPH D. SEIBERLING, P.D.

The structure, and more especially the chemistry, of gelsemium have been frequently investigated. There are still a number of points in the development history, as well as morphology, of this important drug that require consideration. In order to be clear on the portions studied, whole rhizome, overground stem and root, Prof. Kraemer suggested that living specimens be procured. These were obtained from the nurseries of Mr. Meehan, Germantown, and Mr. Lamb, Fayetteville, N. C.

Gelsemium sempervirens, (L.) Pers. (also known as *G. nitidum*, Mx. and *Bignonia sempervirens*, L.) is a woody climber, growing in woods or thickets of the Southern United States and extending along the seaboard into Texas, Mexico and Guatemala. The underground stem is hardy, woody and of varying length. The overground stem is slender and purplish, climbing to a height of 15 to 20 feet or more. The leaves are perennial, lanceolate, short petioled, entire, and opppsite. The flowers are large, in opposite axillary clusters, mostly solitary, although varying from one to six flowered. The calyx is short, consisting of five lobes. The corolla is large, funnel-shaped, bright yellow. Stamens are five in number and inserted upon the base of the corolla tube. "Stigmas in one form, short and anthers exserted; in the other form, longer and anthers included." The fruit is a dry capsule, of a brown color and dehisces septicidally

into two boat-shaped valves. Seeds several, rather large, flat with a broad wing at the summit.

Gelsemium flowers in April, and is popularly known as Yellow Jessamine; also called Evening Trumpet flower and Carolina Wild Woodbine. The odor of the flowers is very sweet, and they are highly poisonous. Mr. Lamb, in a letter to the author, writes of the death of a daughter of the late Dr. Dick, from eating the flowers. In the

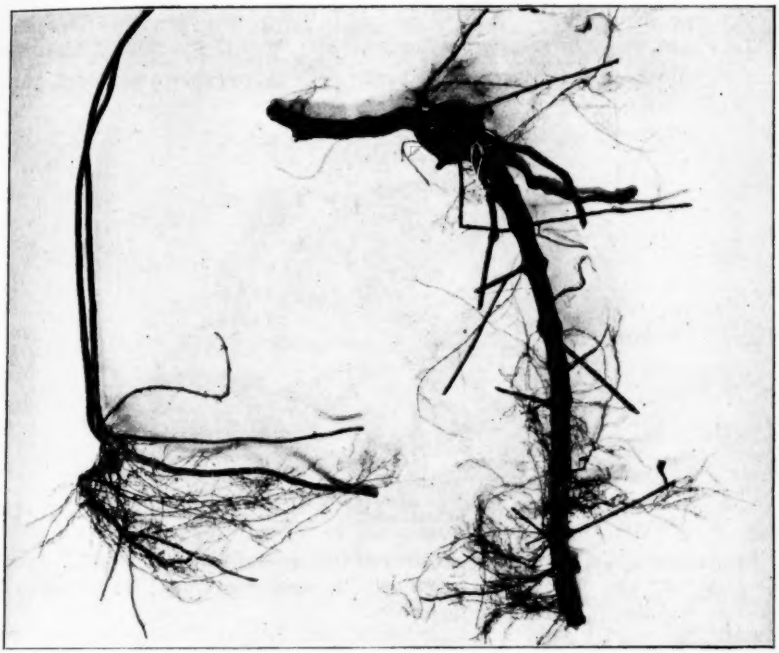

FIG. 1.—The left-hand illustration shows a portion of the rhizome and roots of *Gelsemium sempervirens* (L.), Pers., with a part of the overground stem. To the right is a portion of a large rhizome with roots.

Norfolk (Va.) *Herald* is recorded the death of a child four years old from eating the flowers of this plant; death ensued an hour after signs of illness were manifest.

Jesse G. Shoemaker (AMER. JOUR. PHARM., 1884, p. 130) has contributed an article on the histology of gelsemium, in which stress is laid on the development of the medullary rays as being characteristic in distinguishing roots and stems. The author does not find this to

be a diagnostic feature. Mr. Shoemaker gives as a second character "the tendency of the pith of the stem to be penetrated by several plates of large, thin-walled cells, which divide the pith more or less perfectly into four portions." This layer of cells is an internal phloem, similar to what we find in Solanum Dulcamara and many other plants, and which has been first accurately described in gelsemium by Miss Caroline Thompson (*Bot. Gaz.*, 1898, p. 118). This internal sieve zone is characteristic for the rhizome and overground stem of gelsemium, distinguishing them from the root.

L. E. Sayre (*Amer. Jour. Pharm.*, 1898, p. 11) gives the characteristic differences in structure between the overground stem and

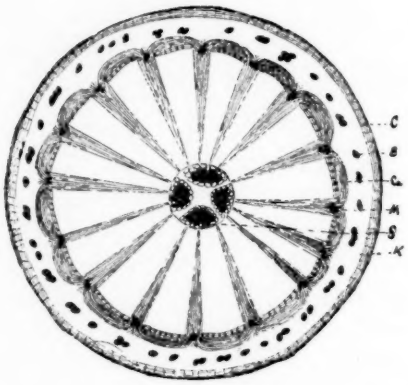

FIG. 2.—Diagram of overground stem of *Gelsemium sempervirens* (L.) Pers. *C*, cork; *B*, bast fibres; *Ca*, cambium; *M*, medullary rays; *K*, crystals of calcium oxalate; *S*, internal phloem.

rhizome to be, that "in the stem are found comparatively large bundles of bast near the wood, just outside the cambium. In the rhizome the bast is arranged near the axillary layer, and in an interrupted ring rather than in bundles." These differences in structure the writer, however, does not find to hold. The position and distribution of the bast fibers in the rhizome and overground stem of gelsemium are about the same. It is possible that in number the bast fibers in the rhizome may exceed those of the overground stems, still this cannot be said to constitute a difference to be relied upon. I will describe the morphology of the rhizome, overground stem and root of the living material that I examined.

OVERGROUND STEM.

The overground stem is that of a woody climber (*Fig. 1*). It is slender, on an average about ½ inch in diameter. Externally it is nearly smooth, marked by longitudinal wrinkles; internally (*Fig. 2*) it is whitish, marked with a pinhole cavity in the center. The epidermis is, in older plants, replaced by a thin layer of cork, from four to six cells thick. Beneath this there are a number of rows of collenchyma cells containing chlorophyll. In the parenchyma cells, lying beneath the latter, are found numerous starch grains, oil globules and large tetragonal or coffin-shaped crystals of calcium oxalate. The latter are found principally in the cells at the terminus of the

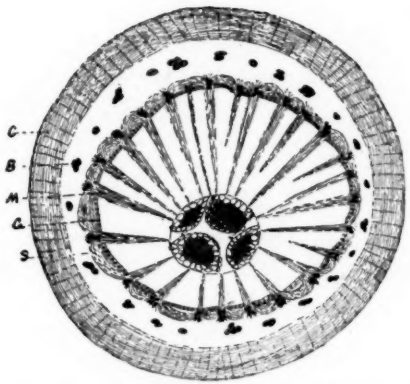

FIG. 3.—Diagram of rhizome of *Gelsemium sempervirens* (L.), Pers. *C*, cork; *B*, bast fibres; *M*, medullary rays, at the periphery of which are crystals of calcium oxalate; *Ca*, cambium; *S*, internal phloem.

medullary ray cells of the inner bark. The bast fibers are very long and silky, and arranged in an interrupted circle through the bark. Medullary rays are strongly lignified, provided with simple pores, are very regularly arranged, widening from within out, being about eight cells in width at the periphery. In the younger plants the internal phloem is not divided, while in the older ones it is divided into four parts, being situated central.

RHIZOME.

The rhizome creeps very near to the surface (*Fig. 1*). It is externally of a brownish-yellow, and internally (*Fig. 3*) of a yellow color. The cork is about eighteen to twenty cells thick. Underneath this

cork the parenchyma cells are large, and contain numerous starch grains and oil globules. The collenchyma cells of the overground stems with their chlorophyll contents are wanting here. In the medullary ray cells of the inner bark are found crystals of calcium oxalate. The latter are similar in size, shape and position to those found in the overground stem. The bast fibres are long, silky, and a little more numerous than in the overground stem. Medullary ray cells are about of the same shape, number and composition as those of the overground stem. The internal phloem, in older plants, is pronounced, divided into four well-marked zones, as in the overground stem. It is similar to that in the overground stem in every respect save position, it being eccentric rather than central.

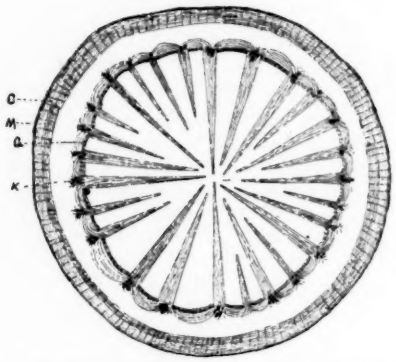

FIG. 4.—Diagram of root of *Gelsemium sempervirens* (L.), Pers. *C*, cork; *M*, medullary rays; *Ca*, cambium; *K*, crystals of calcium oxalate.

THE ROOT.

The root is quite long and spreading. It is externally of a dirty brownish-yellow, and internally (*Fig. 4*) of a yellow color. The thin epidermis in young roots is replaced by a thick layer of cork in the older plants, consisting of from sixteen to eighteen rows of cells. The collenchyma of the stem is wanting. Starch grains and oil globules are distributed throughout the parenchyma of the bark, as it is in the overground stem and rhizome. Similar crystals of calcium oxalate as already described are found in the medullary ray cells of the inner bark. The medullary rays are similar to those described in the overground stem and rhizome, but we find more secondary medullary rays.

To recapitulate:

Rhizome.	*Overground Stem.*	*Root.*
Cork 18 to 20 cells.	Cork 4 to 6 cells.	Cork 16 to 18 cells.
Collenchyma wanting.	Collenchyma, 4 to 7 cells, containing chlorophyll.	Collenchyma wanting.
Parenchyma, containing oil, starch and crystals calcium oxalate.	Parenchyma, containing starch, oil and crystals calcium oxalate.	Parenchyma, containing starch, oil and crystals calcium oxalate.
Bast fibres.	Bast fibres.	Bast fibres wanting.
Cambium.	Cambium.	Cambium.
Medullary rays.	Medullary rays.	Medullary rays.
Ducts and libriform tissue.	Ducts and libriform tissue.	Ducts and libriform tissue.
Internal phloem.	Internal phloem.	Internal phloem wanting.
Hollow center eccentric.	Hollow center central.	No hollow, but elements of primary fibro-vascular bundle in centre.

From this investigation certain new features have come to light regarding the structure of the rhizome, overground stem and root of gelsemium. Prof. Kraemer is of the opinion, from observations made, that all future investigations of the drug, to be of any value, must be made in the home of the plant. Even hothouse material is not sufficient to determine the morphological differences in these various plant portions with which we have to deal.

LITERATURE.[1]

REFERENCES TO GELSEMIUM SEMPERVIRENS AND GELSEMINE IN E. M. J.[2] FROM 1862 TO 1892, INCLUSIVE.

Gelsemium, 1862, p. 48.
" poison by, 1862, p. 121.
Gelsemin, 1863, p. 185.
Gelsemium in delirium tremens, 1864, p. 193.
" 1866, pp. 364, 440.
" 1867, p. 513.
" 1868, pp. 190, 437.
" 1869, pp. 348, 388.
" poison by, 1869, pp. 140, 583.
" galvanizing antidote to, 1869, p. 568.
" 1870, pp. 105, 532.
" 1872, p. 98.
" in tetanus, 1892, pp. 19, 98.
" in odontalgia, 1874, 417.
" 1875, p. 94.

[1] I am indebted to Prof. J. U. Lloyd for the detailed list of references to Gelsemium sempervirens.

[2] *Eclectic Medical Journal*, Cinc.

Gelsemium Lloyd, 1876, p. 105.
" 1877, pp. 44, 93, 245, 329.
" Sp., 1877, p. 11.
" in hernia, 1877, p. 246.
Gelsemin, 1877, p. 548.
Gelsemium, 1878, p. 287.
" poison by, 1878, p. 228.
" in neuralgia, 1878, p. 259.
" therapy, 1879, p. 21.
" poison by, 1879, p. 222.
" 1880, pp. 115, 171, 529.
" 1881, pp. 18, 411.
" in massive doses, 1882, p. 218.
" 1884, pp. 45, 188.
" for tetanus, 1884, p. 417.
" 1886, pp. 283, 315.
" in nausea, 1886, p. 266.
" 1887, p. 442.
" for gastro-intimtration, 1887, p. 445.
" 1888, pp. 114, 214.
" in meningitis, 1888, p. 274.
" 1889, pp. 42, 94.
Gelsemine, death from, 1889, p. 268.
Gelsemium, in chorea, 1890, p. 358.
" 1890, pp. 319, 359.
" in la grippe, 1890, p. 159.
" trade neurosis, 1890, p. 152.
" 1891, pp. 222, 264, 429.
" 1892, pp. 138, 140, 218, 239, 264, 275, 567, 600.

REFERENCES TO GELSEMIUM IN A. PH. A. AND OTHER JOURNALS.

Gelsiminia, xvi, 386.

Gelsemium sempervirens, xvi, 162; xvi, 386.

Gelseminia, prep., prop. Fredigke, xxi, 654; xxii, 105; Robbins, xxv, 135; Wormley, xviii, 276; toxic effects, Wormley, xxv, 312.

Gelsemin (Eclectic) solubility, Parker, xxx, 128.

Gelsemium sempervirens, active constituents, Robbins, xxv, 135; Wormley, xviii, 276; extraction, Dragendorff, xxvi, 86; fluid extract useless as paint for eruption of poison oak, Johnson. xxv, 218; review, Holmes, xxiv, 132; not attacked by Tinea zeæ, Saunders, xxi, 627.

Gelsemine (alkaloid) distinct, from geissospermine, quebrachine and strychnine, Schwartz, xxxi, 284, 2, 5; estimation (gravimetric, with Mayer's solution) Lyons, xxxv, 307 (equivalent in Mayer's solution); Lyons, xxxv, 305 (gravimetric, with phosphomolybdic acid); Snow, xxxvi, 136, 138, formula (Sonnenschein's incorrect); Gerrard, xxxi, 283, prop., Gerrard; Wormley, xxxi, 282, 284; maxim dose, xxxviii, 309.

Gelsemium hydrobromide, hydrochloride, nitrate, sulphate, Gerrard, xxxi, 284.

Gelsemine, Thompson, xxxv, 118; color reaction by oxidation, Lyons, xxxiv, 608.

Gelsemium sempervirens, diagnostic character, Shoemaker, xxxii, 144; exportation, xxxiii, 493; medicinal value, Lane, xxxiii, 132. L. Spiegel, AM. JOUR. PHARM., 1893; also *Chem. Zeit. Report*, 1893, 177, p. 381.

Procter, Jr.: Gelsemium sempervirens, analysis, AM. JOUR. PHARM., Vol. 24, p. 307 (1852).

Hill, F. D.: G. sempervirens, medicinal properties, AM. JOUR. PHARM., Vol. 24, p. 309 (1852).

Kollock: Gelseminia and analysis of G. sempervirens, AM. JOUR. PHARM., Vol. 27, p. 212 (1855).

Procter, Jr.: Gelsemium *versus* Jasminum, AM. JOUR. PHARM., Vol. 40, p. 30 (1868).

Eberle: Gelseminia, AM. JOUR. PHARM., Vol. 41, p. 351.

Wormley: Gelsemium sempervirens, and Gelseminia, and microscopical examination, AM. JOUR. PHARM., Vol. 42, p. 1.

Jos. G. Pinkham: Gelsemium poisoning, AM. JOUR. PHARM., 1871, p. 225.

Chas. A. Robbins: Gelsemium constituents, AM. JOUR. PHARM., 1876, p. 191.

Wormley: Gelsemia preparation, toxic effects, AM. JOUR. PHARM., 1877, p. 150.

Wormley, Th. G.: Gelsemium sempervirens, forensic determination, its relation to Æsculus, etc., AM. JOUR. PHARM., 1882, pp. 336-344.

Edw. Schwartz: The forensic-chemical determination of Gelsemine in animal liquids and tissues, AM. JOUR. PHARM., 1882, p. 389.

A. W. Gerrard, A research on the alkaloid Gelsemine and some of its vegetable salts, AM. JOUR. PHARM., 1883, pp. 256-260.

J. G. Shoemaker: structural characteristics of Gelsemium sempervirens, AM. JOUR. PHARM., 1884, p. 130.

H. H. Rusby: Some native Southern remedies, AM. JOUR. PHARM., 1885, p. 91.

A. B. Lyons: A study of the use of Mayer's reagent in the estimation of alkaloids, AM. JOUR. PHARM., 1886, p. 582, and 1887, p. 4.

H. W. Snow: Mayer's reagent for the estimation of alkaloids, AM. JOUR. PHARM., 1888, p. 494.

L. Spiegel: AM. JOUR. PHARM., 1893, p. 381; also *Chem. Zeit. Repert.*, 1893, p. 177.

A. R. Cushry: AM. JOUR. PHARM., 1893, p. 396.

W. C. Schmidt: Gelsemine, *Pharm. Rundschau*, 1891, p. 185.

Gelsemium root, assay, *Am. Pharm. Assoc. Proceedings*, 1892, p. 263.

Cushry: The bases of Gelsemium sempervirens, *Am. Ph. Assoc. Proc.*, 1893, p 850.

L. Spiegel: Gelsemine, *Am. Ph. Assoc. Proc.*, 1893, p. 850.

E. H. Farr and R. Wright: Structure of Gelsemium, *Am. Ph. Assoc. Proc.*, 1893, p. 460.

A. P. Cushing: Alkaloids of Gelsemium sempervirens, *Am. Ph. Assoc. Proc.*, 1884, p. 1118.

Schwickerath: Assay of Gelsemium root, *Am. Ph. Assoc. Proc.*, 1884, p. 545.

Coblentz, V.: Gelsemic acid, AM. JOUR. PHARM., 1897, pp. 228–439.

L. E. Sayre: Gelsemium, analysis of, AM. JOUR. PHARM., 1897, pp. 234–280.

L. E. Sayre: Gelsemium, rhizomes, roots and stems, AM. JOUR. PHARM., 1897, p. 8.

NOTE ON SAFFRON.*

By Henry Kraemer.

There have been at least three rather detailed and comprehensive publications on saffron—the determination of its purity, substitutes and adulterations. One of the first of these was by Prof. John M. Maisch,[1] who made a most comprehensive report on the saffron of the American market in 1885. In 1892 E. Vinassa[2] gave a most valuable and important contribution to the *Archiv der Pharmacie*, on true saffron and its possible adulterations; and a year later, A. Tschirch[3], in his *Anatomischer Atlas* described and illustrated the important features in the study of saffron with his characteristic force.

Any one who is familiar with the literature on the subject is struck with the large number of vegetable, mineral and animal substances that have been used, as also dyestuffs that have been employed to adulterate the commercial saffron. There has been present, as there is still to-day, the style, stamens[8] and corolla of true Crocus (viz. *Crocus sativus*). There has also been found the flowers of Calendula,[2] Carthamus,[2] Arnica,[2] a flower of N. O. Caryophyllaceæ,[24] and corn;[2] the fruit of paprika;[21] onion scales;[21] wood of santalum rubrum,[28] and hæmatoxylon; fibres of meat;[1, 27] tissues of a sedge;[14] tissues of a cane,[26] wheat flour,[13] glycerin, honey, oil,[25] starch,[13] and mineral substances (principally barium and calcium[7] salts), as also soluble ammonium and sodium salts have been employed.[6, 20] The number of coloring principles[2] that have been used or suspected are at least 18 in number, used either alone or in mixtures,[30] including: acid fuchsin,[24] auramin, *brilliant yellow*, benzo-orange, chrysoidin nitrate, chinolin yellow, chrysophenin, coloring of cochineal,[26] curcumin, *dinitro para-kresol*, dinitro cresolate of sodium;[29] *Jaune vermicelle de Paris*, *Martiu's yellow* (dinitro napthol),[30] *Metanil yellow*, *orange No. II*, Ponceau 2 R, picric acid, nitrate of chrysoidin, tropæolin OOO No. 2,[30] etc. Some of these are toxic in their action, chiefly those given in italics.

The ingeniousness displayed in the adulterations practised is remarkable indeed. In one instance Morpurgo[4] records the presence of barium sulphate, not only upon the outside of the drug, but also

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*Given in Abstract before the Pennsylvania Pharmaceutical Association, June, 1898.

in the cells of the plant. The inference was that a barium salt was first employed, and that afterward a soluble sulphate was used, so that the insoluble barium was precipitated and crystallized in the tissues.

It has been kept in damp cellars[18] in order to increase the amount of water in the drug. The coloring principle has been removed from the saffron, and the exhausted drug artificially colored.[22] The amount of ash found in commercial saffron has been 25 to 30 per cent. (Hart);[5] 26 per cent. (Adrian)[6]; 36 per cent. (*P. J. Trans.*, 1897, p. 223, 257), and 52·7 per cent. (Beringer).[7]

This sums up probably very briefly the extent of the ingenuity that has been employed to dishonestly make money out of the sale of the drug. But it cannot be said that the drug on the American market is so extensively adulterated as the literature would seem to indicate. The extended use of the microscope and of chemical reagents, probably as much as anything else, has made it possible that this, as many other drugs, is not so liable to adulteration.

Under the name of saffron can be purchased in this country chiefly but two products, the one being the stigmas with some styles and also fragments of anthers and perianth of *Crocus sativus*, L., and the other the tubular and perfect flowers of *Carthamus tinctorius*, L. The difference in price between the two being as 1:40 or 1:42, there is in some localities a tendency to substitute the one for the other. This substitution appears in very many cases to result from ignorance. In no case where crocus has been purchased or otherwise secured has there been found any flagrant case of adulteration. The saffron on the market appears to be either *Alicante*, containing more styles, stamens and fragments of corolla, or *Valencia*, consisting almost entirely of stigmas. There is also the American saffron, the product of *Carthamus tinctorius*. There appears to be but little tendency in this country to adulterate saffron with any of the mineral substances. The statement made by the *Ber. d. D. Pharm. Ges.*, 1898, p. 27, that some thousands of kilogrammes of flowers of calendula are shipped from China to America, and that they are not used as dyestuff, but employed in medicine, is worthy some attention. It is possible that this form of adulteration is still practised in some sections of this country—the calendula being either colored and used *per se* or

otherwise.* Much has been written on the subject of saffron regarding the testing of its purity, detection of substitutions, etc. The addition of foreign, inorganic substances is detected by the U.S.P. by incinerating dry saffron and determining the amount of ash. Recently, F. Ranwez[8] has employed radiography to good effect in some quantitative determinations of barium sulphate in saffron. As to what is the minimum amount of non-fusible ash that good saffron should yield has not been determined satisfactorily. Hart obtained 5·12 per cent.;[5] Adrian, 7·14 per cent.;[6] Barclay, 6·32 per cent.[9] in dry saffron. The difference is due in all probability to the fact that the amount of water in the drug examined by these several investigators varied. The results of Kuntze and Hilger[10] are probably of greatest value in this mode of examination: They find that pure saffron should not yield more than 8 per cent. of ash, of which 13·53 per cent. contains phosphoric acid, whilst the ash of safflower contains only about 2 per cent., and that of the flowers of calendula, 0·73 per cent.

A microscopical and micro-chemical examination of saffron on the market is sufficient to determine the character of the product. The sample under examination is either softened in water or in a steam oven and examined preferably with a compound microscope. The most striking thing is the total difference in the nature and structure of the parts. On comparing crocus with the American saffron and the possible adulterant or substitute calendula, we find the following characteristic points of difference.

I. *Crocus* consists of single cornucopia-like stigmas, or, at the most, of three united to a stem (the style). On examining the larger end of the stigma we find that it is fringed with little hairs (papillæ); in among the latter are few or many (although sometimes wanting entirely in individual stigmas) pollen grains. These pollen grains average about 40 to 45 mikrons in diameter. They have a surface that is nearly smooth, and are beset with numerous fine prickles. Some of these grains have germinated and show pollen tubes of various lengths.

II. *Carthamus* consists of the characteristic tubular flowers of the N. O. Compositæ. The flowers are perfect and the corolla tube is

*Since writing this article, Professor True shows (*Pharm. Rev.*, 1898, p. 258) that the saffron of the West contains calendula florets and some are loaded with inorganic substances.

quite long (about 20 to 25 millimeters in length), consequently many of the flowers are broken in one or more pieces. The corolla tube is yellowish or almost colorless. The upper portion is divided into five lobes, which are bright red, and in the dry drug partially surround the anthers. From above these lobes, if the flowers are ripe, project the five stamens, united by means of their anthers (syngenesious). The pollen grains are very numerous compared to crocus, and are somewhat larger and of characteristic shape. The outer surface is extended into a prickly or spiny surface, and when the pollen grains are ripe they are seen to possess three prominent lid-shaped areas, through which the pollen tubes protrude.

On the inferior ovary is a style, which when ripe is longer than the corolla tube. The lower portion of the style is smooth, but above and at the surface of the bifid stigmas it is covered with long hairs. Among the latter are found some germinating pollen grains. Along each of the two fibro-vascular bundles extends a secretion vessel marked as a brown line.

III. *Calendula* consists chiefly of the ligulate corolla of *Calendula officinalis*, L. This is rather long and broad, varying from 15 to 20 millimeters x 5 millimeters. It possesses four prominent veins, and at the apex are four indentations. The epidermis cells of the upper surface resemble those of some other ray flowers of the Compositæ, viz., in that they contain yellowish oily drops. The outer surface of the corolla near the base possesses very peculiar and characteristic hairs. The ovary, style and stigma are not found abundantly in the drug. The style is much shorter than in Carthamus, the stigma is bifid and a *few pollen* grains are met which resemble those of Carthamus and other Compositæ, but are smaller than in Carthamus, measuring at the most 40 mikrons. When Calendula is used as a substitute or adulterant for Crocus, it is colored reddish by means of hæmatoxylin, safranin, fuchsin, etc.

The most striking and characteristic test distinguishing crocus from its substitutes and adulterants is the use of concentrated sulphuric acid. The test may be made on a microscopic slide or in watch-crystal or in a test-tube. The greatest care must be exercised that the glass is clean and that the sulphuric acid is C.P. The acid is added to the saffron or substitute and the following are the characteristic color reactions brought out distinguishing crocus from carthamus and calendula:

Crocus.—The stigmas only become blue immediately, and in a half minute the solution becomes blue, gradually changing to a violet, and finally a deep wine-red color.

Carthamus.—The flowers turn yellow and the solution remains colorless for a few minutes. The latter changes to yellow, and finally, after a much longer time, however, assumes a color similar to crocus, viz., a deep wine-red color.

Calendula.—The flowers turn brown or blackish-brown, as though charred. The solution behaves otherwise much the same as Carthamus.

Of course, in case any of the coloring principles other than those in the drugs have been used, they are easily detected by the proper reagents, as KOH for hæmatoxylin, etc.

This sulphuric acid test was probably first utilized by Joh. Müller[12] for distinguishing true saffron. In a paper on the adulteration of saffron he calls attention to the fact that, on the addition of sulphuric acid to *Crocus sativus* the latter changes to indigo-blue, reddish-purple, and finally blackish-brown. Further, that the leaves of *Crocus vernus*, which is used to adulterate saffron, give a dark green reaction with the same reagent.

Bouillon-Lagrange and Vogel (*Annales de Chim.*, lxxx, p. 188), as early as 1811, had shown the peculiar behavior of the coloring principle in saffron to H_2SO_4, HNO_3, as later confirmed by Henry (*Jour. de Pharm.*, 1821, p. 400), who says, in his essay on the coloring principle of saffron, "le chlore, les acides sufurique et nitrique se comportant avec elle comme MM. Bouillon-Lagrange et Vogel l'ont observé." Kayser's later researches[11] on the chemistry of saffron have added still further to our knowledge of the coloring principle which behaves towards sulphuric acid as already mentioned.

It seems to the writer that the pharmacopœial tests for saffron might be improved by adding a botanical distinguishing test, as well as the sulphuric-acid test, which is so very characteristic for crocus. Only cotton impregnated with iodine would give anything like the same reaction with sulphuric acid.

IMPORTANT REFERENCES TO SAFFRON.

[1] John M. Maisch: *Proc. Am. Pharm. Assoc.*, 1885, p. 504.
[2] E. Vinassa: *Arch. der Pharm.*, 1892, p. 353.
[3] A. Tschirch: *Anatomischer Atlas*, Lief. V, p. 91.

[4] Morpurgo: *Apoth. Zeit.*, 1897, through *Süddeutsche Apoth. Zeit.*, 1897, p. 143.

[5] J. Hart: *Pharm. Jour. Trans.*, 1884, p. 738.

[6] Adrian: *Jour. de Pharm.*, 1888, p. 98, through *Amer. Drug.*, 1889, p. 69; also *Jour. Pharm. Chim.*, 1889, p. 98.

[7] G. M. Beringer: *Amer. Jour. Pharm.*, 1889, 607.

[8] F. Ranwez: *Pharm. Zeit.*, 1896, p. 401.

[9] Barclay: *Pharm. Jour. Trans.*, 1894, p. 692.

[10] Kuntze and Hilger: *Zeitschr. f. anal. Chem.*, 1891; abs. in *Chem. News*, 1891, p. 11.

[11] R. Kayser: *Ber. d. D. chem. Ges*, 1884, p. 2228, through *Jour. Chem. Soc.*, 1885, p. 59.

[12] J. Müller: *Archiv der Pharmacie*, 1844, XL., p. 173.

[13] Herz and Hanausek: *Pharm. Zeit.*, 1893, p. 40.

[14] Wm. Kirby: *Yearbook of Pharm.*, 1890, p. 467.

[15] F. F. Riches and J. Dunning: *Pharm. Jour. Trans.*, 1891, p. 611.

[16] G. Posetto: *Zeitschr. f. Nahrungsm.*, 1891, p. 45.

[17] Heim: *Pharm. Jour. Trans.*, 1896, p. 86, from *Nouv. Rem.*, XII, 217.

[18] Cæsar and Loretz: *Apoth. Zeit.*, 1891, p. 509.

[19] Chas. A. Heinitsh: AMER. JOUR. PHARM., 1867 p. 38.

[20] E. M. Holmes: *Pharm. Jour. Trans.*, 1889, p. 666.

[21] Collardot: *L'Union Pharm.*, 1891, p. 294, through *Pharm. Jour. Trans.*, 1891, p. 85.

[22] Cazeneuve and Linoissier: *Jour. Pharm. Chim.*, 1886, p. 413.

[23] A. Alessi: *Selmi*, 1894, through *Chem. Repert.*, XVIII, 132.

[24] Cesar Chicote: *Jour. Pharm. Chim.*, 1896, p. 116.

[25] Bremer: *Süddeutsche Apoth. Zeit.*, 1897, p. 31.

[26] W. Brandes: *Pharm. Zeit.*, 1879, p. 506, through AMER. JOUR. PHARM., 1879, p. 558.

[27] Wiederstadt: *Archiv der Pharm.*, 1887, p. 73.

[28] J. Herz: *Archiv der Pharm.*, 1886, p. 713.

[29] J. Biel: AMER JOUR. PHARM., 1883, p. 177.

[30] AMER. JOUR. PHARM., 1 91, p. 567.

[31] R. H. True: *Pharm. Rev.*, 1898, p. 258.

Beetroot Cultivation in the United States.—The United States Department of Agriculture has recently issued a report, from which it appears that the production of sugar, which only amounted to 800 tons in 1886, has steadily increased since that period, and exceeded 40,000 tons in 1896. There are eight factories in the country, which are well supplied with all the necessary plant, and it is owing to the successive and rapid establishment of these factories that the national production rose from 2,800 tons in 1890, to 20,453 tons in 1893, and that it shows since 1894 an annual progression of 10,000 tons. If a comparison be drawn between the production of sugar and the consumption during the last ten years, a still more marked advance is evident. The consumption, which was 1,355,809 tons in 1886, gradually increased until it amounted to 1,960,086 tons in 1896, an increase of about 50 per cent., while the population has only increased by 20 per cent. at the most during the same period.—*Board of Trade Journal*, March, 1898.

CRUDE CAUSTIC SODA SOLD IN THE MARKET AS CAUSTIC POTASH.

By Carl E. Smith.

(Report from Research Committee D, Section II., of the Committee of Revision of the U. S. Pharmacopœia.)

In the course of an investigation into the quality of commercial crude caustic potash, the writer has recently examined five samples that proved to be nothing more nor less than caustic soda of varying degrees of purity. Dr. Charles Rice, who requested the writer to investigate this subject, obtained these samples from various sources through which the grocery trade is supplied. They appear to be representative of what is sold in New York City as potash to such consumers as are not supposed to test their purchases chemically. The potash present was no larger in amount than that which crude soda might naturally contain, and in some cases the quantities of chlorides and sulphates were extraordinarily large. As the two alkalies rather closely resemble each other physically, such a substitution may easily be overlooked, and, as some of these products present a very good appearance, pharmacists may sometimes be tempted to use potash obtained from such sources for the preparation of potassium bromide or iodide, soft soap, etc., without considering a previous chemical examination necessary. In some such cases the substitution may not even be detected during the process of manufacture, as in the case of soft soap.

The following table indicates the composition of the five samples, the potash calculated as sulphate, in accordance with a rule formulated by Fresenius:

	A.	B.	C.	D.	E.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Sodium hydrate	65·9	82·8	71·6	87·0	85·2
" carbonate	4·75	5·3	3·18	5·7	3·18
" chloride	17·0	7·45	4·2	2·6	5·5
" sulphate	1·57	2·04	9·25	2·8	2·3
" silicate	0·58	0·33	0·4	0·13	0·55
Potassium sulphate	2·4	0·58	4·35	0·73	0·38
Water	7·0	3·4	6·4	4·7	2·4
Insoluble matter	0·21	none	0·17	trace	trace

Soluble impurities, present only in minute quantities in some of the samples, as alumina and lime, are not taken account of in the table.

This is another instance which shows that the pharmacist should not rely merely on the appearance of his supplies of chemicals for their identity and quality, and again emphasizes the necessity of applying chemical tests, not only to detect intentional substitutions and adulterations, but also to discover such inadvertencies as may occur now and then, even in the most carefully conducted manufacturing and wholesale establishments. In most cases this can be done by very simple means.

Potassium and sodium compounds can be readily distinguished by means of the familiar flame-test. This requires simply a few inches of platinum wire, for which clean iron wire may be substituted, if necessary, and a non-luminous gas flame. A fragment of a pure potassium compound, taken upon a loop of platinum wire and held in a non-luminous flame, colors the latter a pure violet, without a tinge of yellow, which would indicate the presence of potassium. Sodium compounds color the flame intensely yellow. Crude potashes always contain small quantities of soda, but when it is not sufficient to cover entirely the violet of the potassium flame, it is not objectionable for purposes that do not require purified potash. When no violet is visible in the flame, the sample may still consist largely of potash or it may be principally soda, and, when viewed through a plate of blue glass, it can be seen whether potash is present in small or large quantity, by the intensity of color visible through the glass, through which the yellow does not penetrate. It must be kept in mind, however, that the intensity of the potassium flame varies, not only with the proportion of potash in the sample, but also with the quantity taken for the test and the heat of the flame.

Accurate quantitative estimations of potassium and sodium, in presence of each other, can be made only by methods requiring considerable time and attention, but sufficiently exact results for ordinary purposes may be obtained by methods that are at the command of the practicing pharmacist. The one based on the insolubility of potassium bitartrate in mixtures of alcohol and water is, perhaps, the most convenient and satisfactory, when great precision is not required. This is the method directed by the U.S.P. of 1890 for the determination of soda in potash. The sample, dissolved in a small

quantity of water, is accurrately neutralized with a concentrated solution of tartaric acid, with phenolphthalein as indicator. Litmus does not answer, as normal alkali tartrates are alkaline towards it. Exactly the same volume as was required for neutralization is then added to the solution to convert the tartrates into bitartrate of potassium, which is precipitated almost completely, owing to its sparing solubility, and bitartrate of sodium, which remains in solution. By the addition of alcohol the precipitation of potassium bitartrate is made complete. The precipitate is collected on a filter and washed with alcohol until a drop of the washings no longer reddens blue, or preferably neutral, litmus paper previously moistened with distilled water. The filtrate is titrated with decinormal potassium or sodium hydrate, each cubic centimeter corresponding to 0·004 gramme of sodium hydrate. The precipitate of potassium bitartrate on the filter is transferred to a beaker, water added, and then volumetric alkali until neutralized with phenolphthalein as indicator. Heating the mixture hastens solution of the bitartrate. Each cubic centimeter of normal alkali required indicates 0·056 gramme of potassium hydrate. If preferred, the precipitate may be dried and weighed, and the weight obtained multiplied by 0·3, which gives the potassium present in the sample as potassium hydrate.

The actual amount of caustic and carbonated alkali must be determined by titration with sulphuric or hydrochloric acid. The fact is frequently overlooked that in titrating caustic alkalies in presence of phenolphthalein in the cold, one-half of the carbonate present is also included and calculated as hydrate. This is due to the fact that the bicarbonates of potassium and sodium are neutral to phenolphthalein. When the solution is sufficiently dilute, practically no carbon dioxide will have escaped when the neutral point is reached and all carbonate will have been converted into bicarbonate, as shown by the following equations:

$$KOH + HCl = KCl + H_2O \text{ (neutral to phenolphthalein).}$$

$$K_2CO_3 + HCl = KCl + KHCO_3 \text{ " " "}$$

If methyl orange be now added and the titration continued until the color changes, the bicarbonate will have been converted to chloride, thus:

$$KHCO_3 + HCl = KCl + CO_2 + H_2O \text{ (neutral to methyl orange).}$$

The quantities of hydrate and carbonate are then calculated in the following manner: If, for example, 15·5 c.c. of normal acid be required for the titration with phenolphthalein, and 0·35 c.c. in addition, to render the solution neutral to methyl orange, then 15·5 — 0·35 = 15·15 c.c. is the volume required for the hydrate and 0·35 × 2 = 0·7 c.c. for the carbonate in the sample, each cubic centimeter corresponding to 0·056 gramme of potassium hydrate or 0·069 gramme of potassium carbonate.

The objection has been made to this method of titrating mixtures of alkali hydrates and carbonates, that it is untrustworthy because of loss of carbon dioxide during the titration with phenolphthalein. This loss can readily be avoided, as the writer has determined, by diluting the solution to 250 c.c. for each gramme of sample, running in the volumetric acid slowly and stirring continuously and gently to the end of the titration.

Somewhat less care is required in this regard when an excess of barium chloride is added to the solution before titrating, to precipitate the carbonate present. In this case all of the volumetric solution required to render the solution neutral to phenolphthalein is calculated as hydrate. The precipitated carbonate may then be readily estimated by continuing the titration after addition of methyl orange, shaking thoroughly after each addition of acid. The barium chloride used must be neutral to both indicators used, and at least enough to precipitate all carbonate must be added.

Chloride is most conveniently estimated by supersaturating the sample with nitric acid, adding an excess of decinormal silver nitrate, and titrating the excess with decinormal sulphocyanate, with ferric alum as indicator. Each cubic centimeter of the silver solution is equivalent to 0·00354 gramme of chlorine, or 0·00744 gramme of potassium chloride.

Sulphate is determined gravimetrically as barium sulphate, whenever great accuracy is necessary, but very serviceable results may be obtained by titration with barium chloride. The normal solution of the U.S.P. of 1890, containing 122 grammes of pure crystallized salt per liter, may be used. The sample is dissolved in dilute hydrochloric acid, avoiding a large excess, which retards precipitation of barium sulphate. After heating the solution to near boiling, the barium chloride solution is added a drop at a time, shaking after each addition, so long as each drop can be seen to cause

a precipitate. Heating is then continued below boiling, until the precipitate settles, leaving the supernatant liquid clear. A drop of the solution is then added, the precipitate allowed to settle again, and this continued until no further precipitation takes place. If haste is necessary, a little of the supernatant solution, still containing some of the fine precipitate in suspension, may be poured out in two test tubes, a drop of barium solution added to one, and the difference in turbidity noted. If the precipitation is not complete, the contents of the tubes are returned and the procedure repeated as often as necessary. With a little practice, fairly correct results can in this way be obtained very quickly. Each cubic centimeter of normal barium chloride solution corresponds to 0·087 gramme of potassium sulphate.

To test potash for silica, the U.S.P. of 1890 gives the following directions: "If 1 gramme be dissolved in 2 c.c. of water and added to 10 c.c. of alcohol, not more than a slight colorless precipitate should occur within ten minutes (limit of silicate)." The same solution is then directed to be tested for carbonate, as follows: "After boiling this alcoholic solution with 5 c.c. of lime water and filtering, not the slightest effervescence should take place on adding the filtrate to an excess of dilute hydrochloric acid." Any sample containing an appreciable amount of carbonate will give a precipitate when tested as above for silica, although it may be free from the latter, since alkali carbonates are insoluble in alcohol. Potassium carbonate sometimes precipitates in alcohol in a flocculent form, and may then be mistaken for silica. The test for silicate and that for carbonate are thus both vitiated, as the greater part of the carbonate is removed from the solution before testing for it, and the sample can hardly fail to stand this second test. It would be preferable to perform the limewater test for carbonate with an aqueous solution of the sample, or to test for it in the manner indicated in the preceding pages. The most reliable test for silica is probably the one based on the fact that it is rendered insoluble by evaporating to dryness with an excess of hydrochloric acid in a porcelain or platinum dish, and heating for a while at an elevated temperature. Upon cooling, then moistening the residue with strong hydrochloric acid, and, after letting stand a while dissolving in hot water, the silica remains undissolved. For quantitative estimations it is filtered out, washed, ignited and weighed.

The best crude caustic potash available in the New York market at present is not greatly inferior in quality and strength to the standard set by the Pharmacopœia for the purified article, as the subjoined analysis of a sample recently examined will show. It can be obtained in drums containing 10 pounds, or in any larger quantity desired. It is in the form of a yellowish-white, coarse, granular powder, and gives a nearly clear and colorless solution. The composition is as follows:

	Per cent.
Potassium hydrate	86·4
Sodium hydrate	1·8
Potassium carbonate	4·85
Potassium chloride	1·4
Potassium silicate	0·1
Water	5·55

A total absence of sulphate, as noted in this sample, is unusual in crude potash, and the chloride is seldom less than 2 per cent. Alumina and lime are practically absent.

The methods used in the examination of this sample and those discussed at the beginning of this paper, are essentially those recommended by Fresenius. Potassium was estimated by precipitation with platinum chloride, and in some cases the results were confirmed by weighing the mixed chlorides of potassium and sodium, and estimating the chlorine in the mixture. Further corroboration of the absence of more than small quantities of potassium in some of the samples was obtained by the failure of precipitation with an access of tartartic acid or with sodium cobaltic nitrite.

In this connection an experiment was made to determine the sensitiveness of the sodium cobaltic nitrite test. Pure potassium bicarbonate was supersaturated with acetic acid and diluted to definite volumes. On adding the test solution to a solution containing the equivalent of 0·3 per cent. of potassium hydrate, a turbidity began to appear in 1½ minutes. A 0·2 per cent. solution became faintly turbid in 4 minutes. Greater dilutions failed to react even after standing over night. To detect for instance, 2 per cent. of potash in a sample of soda, the test would have to be applied to a solution containing at least 10 per cent. of the sample. Very rough quantitative estimations of potash may be made by diluting a solution of the sample to the point at which a reaction is barely visible within 4 minutes and assuming this dilution to contain 0·2 per cent.

of potassium hydrate. Another way, suggested by Dr. Charles Rice, consists in precipitating the potassium cobaltic nitrite from a concentrated solution of the sample, collecting on counterpoised filters, drying and weighing, another sample, containing a known quantity of potassium being treated in exactly the same manner, and the weights of the two precipitates compared. A large excess of reagent is required to obtain a maximum precipitation, enough to give the supernatant solution a dark brown color. The precipitate is appreciably soluble in water and should therefore not be overwashed. Both samples should be washed with the same quantity of water. As the composition of the precipitate is somewhat variable and the conditions governing the variability have not been determined, sodium cobaltic nitrite cannot at present be used for accurate estimations of potassium.

PHARMACEUTICAL LABORATORY OF THE
NEW YORK COLLEGE OF PHARMACY, July, 1898.

THE CHEMISTRY OF ALOES.

BY ALFRED R. L. DOHME, PH.D.[1]

Aloes is the concentrated juice of the plants of the genus Aloe, principally the varieties Aloe Socotrina, Aloe ferox, Aloe plicatilis, Aloe vulgaris, Aloe Africana and Aloe Perryi. Strange to say, the much-talked-of and official Socotrine aloes does not grow on the island of Socotra, this variety being Aloe Perryi, named after our famous Commodore Perry, who observed it on the island in 1878. Commercially speaking, the varieties of aloes are Socotrine, Curaçoa, Barbadoes, Natal, Cape and Indian aloes. In England they prefer Barbadoes aloes; in Germany, Cape aloes, and in this country, Socotrine and Curaçoa aloes. A correct and reliable division and classification of the varieties of this important drug is as yet only a wished-for but not by any means realized fact. Much of the Socotrine aloes we buy, and, apparently knowing, label "True Socotrine Aloes," is a mixture containing various varieties, and no doubt largely Curaçoa aloes. As we all know, Socotrine aloes costs about 25 cents a pound, while Curaçoa aloes costs only about 3 cents a

[1] Read at the meeting of the Maryland State Pharmaceutical Association at Blue Mountain House, Maryland, on June 23, 1898.

pound; and, as we also know, the pharmacist nearly always calls for and uses the former, thinking the latter a cheap, malodorous substitute. If any aloes can be called not malodorous, and if comparisons of malodor can be made by skilled pharmaceutical olfactory nerves, perhaps it is safe to say that Curaçoa aloes is the stronger in odor, although not as unpleasant as Cape aloes. Whether or not the famous saffron-like qualities of Socotrine aloes justify us in investing 22 cents a pound for the saffron aloes is, however, another question, and I would like to ask the many skilled pharmacists seated before me if they always prefer the saffron-flavored aloes because of its saffron or because it is official. If it could be shown that Curaçoa aloes or any other aloes is as efficient as its saffron-flavored sister, would they still stand by the U.S.P. and pay 22 cents tribute to the latter or to the saffron flavor? I certainly would not. Drugs have been but little studied, and our standards for the same are necessarily vague and indefinite. When, however, science has taken a drug in hand and given us standards, and thereby upset our former macroscopical and necessarily superficial criteria as to their relative value, should we not accept the results of her revelations and adopt the benefits thereof? We know that aloin is one of the active principles of aloes, and if not the only one, as I shall show, still the main one, and a principle that we all know perfectly well is uniformly efficient and gives us all the results of the drug. If we can show that Curaçoa aloes contains as much and frequently more aloin than Socotrine aloes, are we not reasonably certain that the one is as efficient and valuable as the other, for certainly the odor of the aloes has no influence on the lower bowel? I have made comparative assays of Socotrine, Curaçoa and Cape aloes, and have found that they contain approximately the following relative amounts of aloin: (M. P., 103° C.) Socotrine aloes, soft in monkey skins, 7½ per cent. average of 3 assays. (M. P., 110° C.) Curaçoa aloes, hard and livery and of a light chocolate color, 18·5 per cent. in 3 assays. (M. P., 107° C.) Cape aloes, hard, glassy and black in color, 4½ per cent. average 3 assays. Inasmuch as practically all the aloin in this country is made from Curaçoa aloes as it is in England from Barbadoes aloes, and we have all found that it is usually efficacious and produces the desired effects, we cannot but conclude in the face of the above assays that no reason exists, as far as we know, why we should not use Curaçoa aloes to the

exclusion of the Socotrine, especially as it costs only about one-eighth as much. So much for the commercial side of aloes. T. and H. Smith, in 1851, and Stenhouse, Flückiger, Tilden, E. Schmidt, Liebelt and Groenewald since have studied aloes as to the aloin obtained therefrom. The Smiths operated on Barbadoes aloes, and obtained what they called barbaloin, formula $C_{17}H_{18}O_7 + H_2O$. Flückiger, in 1871, decided that the aloin he and Histed obtained from Socotrine aloes was not, as Pareira had stated, identical with barbaloin, but was $C_{15}H_{16}O_7$. From these aloins, notably barbaloin, Tilden had obtained by the action of strong oxidizing agents such as potass. bichromate, alaxanthin or methyl-tetra-oxyanthraquinone, thus indicating that aloin was a derivative of anthraquinone. As we all know, aloes contains besides the aloin, quite a quantity of resin, which has, however, as yet not been investigated. Tschirch and his pupils at Bern have been these past four or five years investigating in order the various resins, beginning with tolu, benzoin, peru, etc. He has recently taken up the resin of aloes, and finds it to be like the other resins, an ester or organic salt, made up in case of Barbadoes aloes of cinnamic acid, and one of that peculiar and characteristic class of resin alcohols, which he finds in all resins and has named "resinotannols" and which he has named "aloresinotannol." It is a gray-brown powder of formula $C_{22}H_{26}O_6$, and contains two hydroxyl groups, as he obtained from it a di-benzoyl derivative. The resin of Cape aloes was similarly treated, and yielded the same aloresinotannol; but to demonstrate that the resin was different from that of Barbadoes aloes, he found that the acid in combination with it was not cinnamic but para-cumaric acid. The resin of Socotrine aloes has not been taken up as yet, but the aloin from the three aloes was next considered. Here some most unexpected valuable and interesting observations were made, and as the result of close observation of a certain color reaction of aloe, known as Borntraeger's test for aloes. It is this: aloes or aloes solutions, when treated with either benzin or benzene, yield to these solvents a yellow substance which turns cherry-red on the addition of ammonia. It was noticed that Cape, Barbadoes and Curaçoa aloes gave the reaction, while Natal and liquid or true Socotrine aloes did not. The color was not due to the aloin or to the resin, as both of these, when pure, did not give it, but to another substance which no one ever thought was contained in aloes, and

which was obtained from the latter, or from aloin obtained from the first three kinds of aloes just mentioned. It is emodin, the great laxative, to which rhubarb, senna, cascara, frangula, owe their laxative properties. It can be obtained from aloin by extracting this with ether, from which it will crystallize, and can be purified by sublimation. Hence the so-called Borntraeger's reaction for aloin is not, correctly speaking, a reaction for aloin but for emodin; aloin that has been deprived of emodin not giving the reaction. A test of the emodin obtained from Barbadoes aloes showed that in doses of half to one grain it possesses marked purgative properties, and in smaller doses quite marked laxative properties, and it was shown that this property is due to increased peristalsis of the intestine. It was further shown that solutions of pure aloin, when allowed to stand exposed to the air, develop in a very short time quantities of emodin which were isolated and analyzed. The same result can be obtained by heating aloin with a 1 per cent. solution of caustic potash. Whether the reaction is one of oxidation or of saponification has not yet been determined, but it is believed that the laxative properties of aloin are due to emodin, and that even if our aloin that has been deprived of all emodin is taken into the system the conversion of the same into emodin in its passage through the system is the cause of its laxative property. While this does not detract from the value of aloin, it much increases our interest in this substance, and accounts for the unusual efficacy and popularity of cascara sagrada, whose active principle, the glucoside purshianin, which it was my good fortune to be the first to isolate, does, as we know easily by saponification, split up into sugar and this same emodin. The result of this valuable contribution to pharmaceutical science of Professor Tschirch and his pupil, G. Pedersen, will be to stimulate the interest in emodin, and probably to give us a ready means of making it on a large scale. To sum up the points brought out in this paper: (1) That Curaçoa aloes is as efficient and, being much cheaper, should be used in preference to Socotrine aloes, the greater portion of which as sold to-day is made up anyway of Curaçoa aloes. (2) That the resin of aloes is an ester or organic salt, and varies according to the kind of aloes, and that the varying constituent is the acid, the alcoholic constituent being aloresinotannol and being the same in both Barbadoes and Cape aloes, the only two thus far ex-

amined. (3) That aloin contains emodin, to which its laxative property is probably due. (4) That many laxative drugs, such as senna, cascara sagrada, rhubarb, buckthorn bark, besides aloes, owe their laxative property to this substance emodin or some substance like it, derived from anthraquinone, and homologous or isomeric with it. Work is now in progress to show the exact relation of anthraquinone to our well-known laxatives.

ESTIMATION OF NITRITES: A CORRECTION.

In a paper that appeared in the June number of this Journal, the undersigned reported a method for the valuation of amyl nitrite and spirit of nitrous ether, which is a modification of a method proposed by B. Grützner for the estimation of nitrites in general, being at that time unaware of the fact that a similar adaptation had been published in 1897 by F. Dietze (*Südd. Apoth. Ztg.*, 1897, No. 35). In a recent number of that periodical, for a copy of which the writer is indebted to Dr. Dietze, in which he remonstrates against the failure to take notice of his work and the German literature on the subject. Inasmuch as Dietze's work was published in a journal that is evidently not always taken cognizance of by those periodicals that may be looked upon as the repositories of everything valuable in current literature, this charge is hardly justifiable. The writer has no desire to ignore the results of German investigators, and has always endeavored to give credit wherever it was due. It was thought justifiable to assume that all published work of any importance, bearing on pharmaceutical-chemical analysis, would be found in such standard periodicals as *Chem Centralblatt* or *Zeitschrift f. anal. Chemie*, in neither of which any reference to the subject in question was found.

The merit of first applying the principles involved in the method to the estimation of nitrites is Grützner's. To Dietze belongs the credit of having first adapted the method to the valuation of spirit of nitrous ether, and to E. Buettner (*Südd. Apoth. Ztg.*, 1897, No. 98) the credit of confirming its usefulness for that purpose. The undersigned presents the claim of having independently adapted Grützner's method to the estimation of ethyl and amyl nitrite, at a later date, and of furnishing the first conclusive proof of its accuracy and reliability.

CARL E. SMITH.

NEW YORK, July 7, 1898.

GLEANINGS FROM THE MEDICAL JOURNALS.

By Clement B. Lowe, M.D.

At the Twenty-seventh Congress of the German Surgical Society, held at Berlin, April 13 to 16, 1898, Professor Kröwlein (Zurich) gave

THE RESULTS OF SERUM THERAPY IN DIPHTHERIA.

He demonstrated by his statistics that serum treatment is no longer in the stage of empiricism, but rests on a tangible foundation. He said that since the serum was introduced in 1894, he had used it on every case of diphtheria that came into the hospital.

The statistics of his clinic from 1880 to 1890 are:

Total number of diphtheria cases before introduction of serum	1,336
Total number of deaths	594
Percentage of deaths	39 p.c.
Total number of cases after introduction of serum	437
Total number of deaths	55
Percentage of deaths	12 p.c.
Number of cases operated on (tracheotomy, etc.) before serum	662
Number of deaths	432
Percentage of deaths	66 p.c
Number of cases operated on after introduction of serum	101
Number of deaths	36
Percentage of deaths	35 p.c.
Number of cases without operation before serum	674
Number of deaths	96
Percentage of deaths	14 p.c.
Number of cases without operation after introduction of serum	336
Number of deaths	19
Percentage of deaths	5 p.c.

The speaker called attention to several points: (1) The general decrease in mortality; (2) the decrease in the number of cases in which operation was necessary; (3) the decrease in mortality of the cases operated on. He thought he was able to notice improvement at once after treatment was begun, by a fall of the temperature, the loosening of the membrane, a decrease in the size of the involved glands, and the fact that the process extended no further. Cases of the extensive involvement of the mucous membrane of nose, mouth and larynx were never seen since 1894.—*Phila. Med. Jour.*, May 7, 1898.

THE MEDICAL SERVICE OF THE ARMY.

To each regiment there is allotted one surgeon and three assistant surgeons, one hospital steward and two assistants, and twelve

privates. This is not a very large number of care-takers, when one realizes that in times of peace there is, in most communities of the Eastern States, an average of about 500 unmenaced persons to one physician and a large number of nurses.

The plan, as at present outlined, is that the rear of each division of the army will be provided with dressing places for emergencies, to which those wounded would be immediately brought. Considerably farther in the rear there will be an ambulance station, where more detailed work of a surgical nature may be done. At a still greater distance from the field will be three hospitals corresponding to the three brigades composing that division. These field hospitals will naturally be tents, each capable of affording accommodations for 400 or more wounded. A large number of ambulances serve the purpose of transportation of the wounded from the front to the hospital. During action the medical staff takes as sheltered a position as possible in the rear of its own regiment, in order to better provide for the immediate wants of the wounded. It is intended that those surgeons who work directly behind the fighting line shall be provided with simple drugs for the relief of pain, shock, fainting, heat or exhaustion. They will also be provided with such surgical instruments as are required for minor operations.—*Boston Med. and Surg. Jour.*, May 12, 1898.

TO ABORT ERYSIPELAS.

Lobit uses a 10 per cent. iodoformed or iodoled collodion, with which he has cured twenty-five cases within three or four days.—*Lem. Med.*, March 30, 1898.

RADIOGRAPHY OF THE STOMACH.

By mixing bismutum subnitricum with the food and beverages, Roux and Balthazard have succeeded in watching the contractions and action of the stomach during digestion, with the fluoroscope, and taking a series of radiographs of the entire process in dogs. —*Deu. Med. Woch.*, April 7th, *from Arch. de Phys.*, x, p. 85.

SODIUM SACCHARINATE.

The above is claimed to be one of the best intestinal antiseptics to date, without secondary effects. One gramme once or twice a day will notably diminish the number of bacteria in the intestines,

especially the Bac. coli. Take in wafers or apenta water.—*Jour. Amer. Med. Assoc.*, May 21, 1898.

IMPORTANCE OF SUGAR AS A FOOD.

Chauveau recently demonstrated before the *Paris Académie des Sciences* that the general assumption in regard to the amount of calories produced by sugar is erroneous. Instead of the theoretic assertion that 3 grammes of sugar are equivalent to the nine calories produced by the consumption of 1 gramme of fat, only 0·756 gramme of sugar is required to produce this same amount of calories. He urged the repeal of duties which tend to restrict the use of sugar, contending that the people should be urged to use it more freely.—*Jour. Amer. Med. Assoc.*, May 21, 1898.

THE ANTI-EMETIC PROPERTIES OF ICELAND MOSS.

Deguy and Bricemarct (*Journal des Practiencs, annali di farmacoterapia e chimica*, April), in making use of a tincture of this drug on account of its nutrient, demulcent and bitter tonic properties in cases of gastric disturbance, find that it possesses marked anti-emetic properties. From 30 to 50 drops are administered in a little seltzer water. The drug does not seem to have any effect on hysterical vomiting, and the authors have not as yet had occasion to use it in the vomiting of pregnancy.—*Vide New York Med. Jour.*, May 21, 1898.

COMPULSORY VACCINATION.

While England (*Revue Medicale*, Quebec, May 4) is still disputing over Jenners' discovery, Japan has made not only primary vaccination but quinquennial vaccination compulsory, and ordains the exclusive use of aseptically prepared calf lymph.

HYDRASTIS CANADENSIS.

In the *Independance Medicale* for April 17th, M. Marini, of Bagdad, relates his experience with this drug in the treatment of hæmorrhage in case of hæmorrhoids, tuberculosis and dysentery, and states that he has obtained remarkable results. He also maintains that it is the preferable remedy in the hæmorrhages of fibromyoas, and that it is the best means of combating the hæmorrhages of pregnancy at any stage, provided that it is taken at sufficiently prolonged intervals; that is, 20 drops of the fluid extract every

three hours, or four times a day. He claims that it is a therapeutic substance which is very valuable in obstetric practice, and is certainly superior to ergot of rye; it does not present the inconveniences of the latter, and may be administered freely, either as a curative or as a prophylactic in the metrorrhagias in all stages of pregnancy, labor or delivery; and during the puerperium, it is also a much safer remedy in the hands of midwives than ergot of rye.—*N. Y. Med. Jour.*, May 21, 1898.

DIET FOR CONSUMPTIVES.

The following excerpts are taken from a lecture delivered by Prof. Reynold W. Wilcox, M.D.:

Gentlemen:—You have just had an opportunity of examining a number of cases of pulmonary tuberculosis. If I were asked, in patients of this particular class, what was the most important thing to be done, I would say "feed them." It is more important than climate. Feeding stands in the first place, but it presents more difficulties than perhaps any other phase of treatment. You may talk as much as you please about tuberculosis being an infectious disease; there is no doubt that any system of treatment which deals with tuberculosis as an infection, and which ignores the patient, is going to fail. That has been the fault with laboratory men, but it is a fault which they are fast correcting. The findings of the laboratory deal with the conditions of the disease; we, as physicians, cannot fail to consider the patient. Without going into the question of pulmonary antiseptics; without going into the questions in relation to the value of particular drugs in their direct action on the results of the activity of the tubercle bacilli, or upon the elimination of ptomains, we shall consider the question of prime importance, *i. e.*, the feeding of the patient.

* * * * * * *

The true diet of a patient suffering from pulmonary tuberculosis, I believe, should consist of meats, starches and fats, with an excess of the last, and a certain amount of phosphates.

* * * * * * *

Nothing discourages an old tuberculosis patient so much as to find that he is bathed in a cold, clammy perspiration. This can be done away with in a large proportion of cases. If you will waken the patient about 4 o'clock in the morning sufficiently to take a

glass of warm milk with a little alcohol in it, the sweating will be greatly reduced, and it will not have the same demoralizing effect upon him. In this way you get a little extra food into the patient, and at the same time prevent the prostration which is associated with this sweating.

The secret of feeding tuberculous patients is to give them light and nutritious food, and food which is easily digestible, feeding them "early and often."

The article, which should be read in its entirety, is contained in the *Medical News*, May 7, 1898.

RECENT LITERATURE RELATING TO PHARMACY.

THE LIQUEFACTION OF HYDROGEN AND HELIUM.

In a paper entitled "The Liquefaction of Air and Research at Low Temperatures" (*Proc. Chem. Soc.*, 1895, **11**, 221), an account was given by James Dewar, LL.D., F.R.S., of the history of the hydrogen problem and the result of the author's experiments to the end of the year 1895. The subject was again discussed in a lecture on "New Researches on Liquid Air" (*Proc. Roy. Inst.*, 1896, **15**, i, 144), and a sketch given of the apparatus employed for the production of a jet of hydrogen containing liquid. It was shown that such a jet could be used to cool substances below the temperature which could be reached by the use of liquid air, but all attempts to collect the liquid in vacuum vessels failed. The type of apparatus used in these experiments worked well, so it was resolved to construct a much larger liquid-air plant, and to combine with it circuits and arrangements for the liquefaction of hydrogen. This apparatus, admirably constructed by the engineers, Messrs. Lennox, Reynolds and Fyfe, took a year to build, and many months were occupied in testing and making preliminary trials. The many failures and defeats need not be detailed.

On May 10th, hydrogen was liquefied by allowing gas, cooled to — 205°, and under a pressure of 180 atmospheres, to escape continuously at the rate of from 10 to 15 cubic feet per minute from the nozzle of a coil of pipe in a double silvered vacuum vessel of special construction, surrounded with a space kept below — 200°. Liquid hydrogen commenced to drop from this vacuum vessel into another doubly isolated by being surrounded with a third. On this

occasion, 20 c.c. of liquid hydrogen were collected in about five minutes, and on May 12th 50 c.c. were obtained before the hydrogen jet froze up from the solidification of air in the pipes. The yield of liquid was about 1 per cent. of the gas. The hydrogen in the liquid condition is clear and colorless, showing no absorption spectrum, and the meniscus is as well defined as in the case of liquid air. The liquid must have relatively high refractive index and dispersion, and the density appears to be in excess of the theoretical value, 0·18 to 0·12, deduced respectively from the atomic volume of organic compounds, and from the limiting density found by Amagat for hydrogen gas under infinite compression. The author's experiments on the density of hydrogen in palladium gave a value 0 62 for the substance in combination, and it will be interesting to find the density of the actual liquid at its boiling point. Not having arrangements at hand to determine the boiling point, two experiments were made to prove the excessively low temperature of the boiling fluid. In the first place, a long piece of glass tubing, sealed at one end, but open to the air at the other, and cooled by immersing the closed end in liquid hydrogen, immediately filled, where it was cooled with solid air. The second experiment was made with a tube containing helium.

The *Bulletin* of the Cracow Academy for 1896 contains a paper by Professor Olszewski, entitled "A Research on the Liquefaction of Helium," in which he states that "as far as my experiments go, helium remains a permanent gas and apparently is much more difficult to liquefy than hydrogen." Helium, which has been extracted from Bath gas by the liquefaction method described last year (*Proc. Chem. Soc.*, 1897, **13**, 190), and sealed up in a bulb with a narrow tube attached, was placed in liquid hydrogen, and a distinct liquid was seen to condense. A similar experiment, made with the same helium tube in liquid air under exhaustion, instead of in liquid hydrogen, gave no visible condensation. It would thus appear, as already suggested by the author (*loc. cit.*), that there cannot be any great difference in the boiling points of helium and hydrogen. A fuller account of the work will appear in the *Transactions*.

All known gases have now been condensed into liquids which can be manipulated at their boiling points under atmospheric pressure in suitably arranged vacuum vessels. With hydrogen as a cooling agent, it will be possible to get within 20° or 30° of the

zero of absolute temperature, and its use will open up an entirely new field of scientific inquiry.

During the whole course of the low-temperature work carried out at the Royal Institution, the invaluable aid of Mr. Robert Lennox has been at the author's disposal, and it is not too much to say that, but for his engineering skill, manipulative ability and loyal perseverance, the present successful issue might have been indefinitely delayed. The author's thanks are also due to Mr. J. W. Heath for valuable assistance in the conduct of these experiments.

BISMUTH SUBNITRATE.

In an article on the composition and tests for bismuth subnitrate, Thoms (in *Ber. d. Deutsche Pharm. Ges.*, 1898, Heft 4) says that according to the amount of water employed, and the temperature at which the salt is precipitated, as also according to the temperature at which the preparation is dried, does it consist of the following products in varying proportions as $Bi(OH)(ONO_2)_2$, $BiO(ONO_2)$, $BiO(OH)$ and water. Thoms recommends the Pharmacopœia to direct that upon heating the salt to redness 100 parts should yield 79 to 80·5 parts of bismuth oxide. Further, if 2 grammes of the nitrate are mixed with a number of cubic centimeters of water in a 100 c.c. measuring flask, and treated with 10 c.c. of normal KOH solution for several minutes, and the flask then filled up to the 100 c.c. mark, 50 c.c. of the clear liquid should not require less than 2·1 c.c. normal hydrochloric acid (21 c.c. $\frac{n}{10}$ normal hydrochloric acid) or more than 2·4 c.c. normal hydrochloric acid (24 c.c. $\frac{n}{10}$ normal hydrochloric acid).

The author gives the following method for determining the amount of nitric acid contained in the salt. Into a 100 c.c. graduated flask is introduced 2 grammes of bismuth subnitrate; this is mixed with a few cubic centimeters of water and shaken. To this is then added 10 c.c. normal KOH solution, and the mixture shaken for about five minutes. The flask is then filled to the 100 c.c. mark with distilled water, well shaken and allowed to stand until the mixture has settled so that the supernatant liquid is clear, 50 c.c. of the latter is removed by means of a pipette, and titrated with normal hydrochloric acid, using phenolphthalein or litmus as an indicator.

The number found is subtracted from 5 and the result represents the number of cubic centimeters of normal KOH solution that were required to neutralize the nitric acid necessary to form 1 gramme of bismuth subnitrate. 1 c.c. of KOH expresses 1,000th part of the equivalent of $\frac{N_2O_5}{2} = \frac{108}{2} = 54$, *i. e.*, 0·054 gramme. This multiplied by 100 gives the per cent. of bismuth subnitrate.—*Apoth. Zeit.*, 1898, p. 318.

STARCH FERMENTS.

Wyatt Wingrave has made a comparative examination, both chemically and clinically, of a number of preparations of starch ferments easily obtainable. His attention was confined to the vegetable or diastatic ferments, which, he remarks, are easily obtained, stable, reliable in action and economical in price. The best-known samples are malt-diastase and taka-diastase. His conclusions may thus be briefly summarized: (1) That of the commercial starch or diastatic ferments taka-diastase is the most powerful and the most reliable, since it is more rapid in its action—*i. e.*, it will convert a larger amount (of starch) in a given time than will any other amylolytic ferment. (2) That taka-diastase seems to be less retarded in its digestive action by the presence of the organic acids (butyric, lactic, acetic), and also by tea, coffee and alcohol, than are saliva and the malt extracts. (3) That all mineral acids, such as hydrochloric, etc., quickly stop and permanently destroy all diastatic action if allowed sufficient time and if present in sufficient quantities. (4) That taka-diastase and malt-diastase have, like ptyalin, no action upon cellulose (uncooked starch).—*The Lancet*, 1898, No. 3897, p. 1251.

STROPHANTHIN AND STROPHANTHIDIN.

Thoms was the first to prepare pure strophanthin, and at the same time to show that the difficulty of previous authors in obtaining a pure product was due to the presence of cholin and trigonellin in the seeds of strophanthus. Several other authors, viz.: Kohn and Kulisch and Feist (*Ber. d. D. Chem. Ges.*, 1898, p. 534), have further contributed to our knowledge of these principles. Kohn and Kulisch have confirmed the results of Arnaud, who proposed the formula for strophanthin as being $C_{31}H_{48}O_{12}$. Feist, however, gives the formula for the same substance, when dried over sulphuric acid

or at 105°, as $C_{32}H_{48}O_{16}$. The glucosidal character of this principle was not confirmed by these authors.

Feist obtained the insoluble decomposition product of strophanthidin. This is a crystallizable, neutral body, insoluble in water and ether, and sparingly soluble in alcohol. The M. P. is 169°–170°; it decomposes at 176° with frothing; it crystallizes upon cooling, and melts then first at 232°. Strophanthidin has the formula $C_{26}H_{38}O_7 + 1\frac{1}{2} H_2O$, and gives off easily a molecule of water upon drying. According to Feist, strophanthidin is a benzol derivative.

CEARIN, A NEW OINTMENT BASE.

Issleib mentions a new base (*Ber. d. Deutsch. Pharm. Ges.*, 1898, p. 127), which is prepared from 1 part of white Carnauba wax and 4 parts of liquid paraffin. The two are melted together and stirred until cold. The cearin is of a snow-white color, soft and of a uniform consistency. According to the author, it is stable, and an efficient substitute for Ung. Paraffin. Ung. Potassi Iodidi may be prepared with this base without the use of sodium hyposulphite. Ung. Hydrargyri Rub. and Ung. Plumbi have been prepared with this base, and kept eight months without suffering any change. Cearin also has the property of taking up from 15 to 18 per cent. of water.

EXAMINATION OF INSECT POWDER.

Durrant (*Pharm. Post*, 1898, 16) proceeds as follows: About 6 grammes of the insect powder are placed in a glass cylinder of a capacity of 30 c.c., and moistened with ether (specific gravity 0·735). The flask is closed with a plug of absorbent cotton, and the mixture allowed to macerate for about thirty minutes. The ether is then poured off and the maceration process repeated four times. The powder is finally washed with ether, so that a volume of about 30 c.c. is obtained. This ethereal solution should be of a beautiful yellow color; if green, the powder is likely to have been adulterated. If there is an absence of a pronounced green color, the solution is distilled at a temperature not higher than 93°, and the residue weighed in a tared dish. This residue should not weigh less than 0·243 gramme. In the best insect powder, the weight of the residue is about 0·356 gramme, and possesses the characteristic odor of the flowers.—*Pharm. Zeit.*, 1898, p. 325.

EDITORIAL.

OCCURRENCE OF METHYL SALICYLATE IN THE VEGETABLE KINGDOM.

It has been thought that the finding of certain chemical constituents in several plants might have some systematic value. The presence of solanine in several species of Solanum might be considered as of having some diagnostic value in considering the plants belonging to this genus, just as strychnine[1] seems to be confined to the genus Strychnos, or, at the most, to the N. O. Loganiaceæ; quinine to cinchona, etc. The modern researches of the plant chemist would seem to indicate, however, that there is more uniformity in the products manufactured from different plants, and that while there may seem to be certain restrictions in some cases, in other cases there is no end to the distribution and manufacture of similar principles in plants rather widely separated. For instance, hydrocyanic acid, which was supposed to be confined to the sub-orders Amygdaleæ and Pomeæ of the N. O. Rosaceæ, is now found[2] in *Phaseolus lunatus*, L. (N. O. Leguminoseæ); *Passiflora quadrangulata*, L. (N. O. Passifloraceæ); *Colocasia gigantea*, Hook. fil. (N. O. Aroideæ); *Kairimia zeylanica* Arn. (N. O. Celastrineæ), and a species of *Cupania* (N. O. Sapindaceæ). It is also found, according to Peckolt, in the root of *Manihot utilissima*[3] (N. O. Euphorbiaceæ) and *Vicia*[3].

The results of the work of plant chemists recently would indicate possibly that methyl salicylate is likewise much more widely distributed in the plant kingdom than was supposed. The earliest reference to the occurrence of methyl salicylate is by Haase,[4] who distilled *Viola tricolor*, L., with water, and obtained an ethereal oil, lighter than water and possessing an odor of peach kernels (Pfirschkern). This investigation seems never to have been further confirmed save by Kraemer,[5] who found that upon rubbing younger portions (Sposs-spitzen) of *Viola tricolor*, L., *var. vulgaris*, Koch, and *V. tricolor*, L., *var. arvensis*, Murray, between the fingers, an odor of methyl salicylate was apparent. This subject still requires chemical investigation, although several authors have determined the presence of salicylic acid in Viola tricolor.

The first record, according to J. U. Lloyd,[6] of the therapeutic use of this oil is to be found in empirical medicine. "The following reprint from an anonymous writer,[7] establishes the subject more clearly, in that it gives a very fair description of oil of gaultheria, as well as making a statement to the effect that it is the same as sweet birch oil, and showing further that many different plants yield the same oil."

"Oil of *Gaultheria procumbens* is the heaviest essential oil of which we have any knowledge; for I have found it to be 1·17. This furnishes us with an easy mode of testing its purity. The wonderful success of Swaim's Panacea has brought this oil into great vogue with all venders of catholicons, panaceas and syrups of sarsaparilla. It appears to be a vegetable principle secreted in

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[1] *Die Pflanzenstoffe*, p. 1281.
[2] *Nederl. Tijdschr. voor Pharmacie*, p. 1; through *Pharm. Zeit.*, 1898, p. 304.
[3] AMER. JOUR. PHARM., 1872, p. 455.
[4] *Inaug.-Dissert. über Viola tricolor*, Erlangen, 1782.
[5] *Inaug.-Dissert. über Viola tricolor*, Marburg, 1897.
[6] *Pharm. Review*, 1898, p. 176.
[7] AMER. JOUR. PHARM., 1831, p. 199.

plants very widely separated by their natural affinities. The *Betula lenta* or sweet birch, secretes it in the bark; the *Polygala pauciflora* in its roots; the *Spiræa ulmaria*, the *Spiræa lobata* and the *Gaultheria hispidula* in their roots and stalks."

According to Lloyd (*loc. cit.*), Dr. Jacob Bigelow[8] had, previous to this anonymous writer and three years prior to Pagenstecher's work,[9] described oil of wintergreen as occurring in the bark of *Betula lenta*, *Gaultheria procumbens*, *G. hispidula*; also in *Spiræa ulmaria* and the root of *S. lobata*.

In *Schimmel's Bericht*[10] we find the following summary of the plants yielding methyl salicylate:

"Salicylate of methyl has recently been detected by E. Bourquelot[11] in the root of *Polygala vulgaris*, L., *P. depressa*, Wender., and *P. calcarea*, Schulz, as well as in the stalks of *Monotropa hypopitys*, L. Bourquelot considers it probable that, as is also the case with the bark of *Betula lenta*, the ester is not present in the above-mentioned plants in the free state, but is formed by the action of a ferment upon a body analogous to Procter's Gaultherin.

"Salicylate of methyl appears to occur rather frequently in the vegetable kingdom; so far as we are aware, it has, up to the present, been found in:

Gaultheria procumbens, L. (flowers and leaves)	CAHOURS, 1843.
" *punctata*, Blume (" " ")	DE VRIJ, 1871.
" *leucocarpa* " (" " ")	
" *Leschenaultii*, D. C.[12] (ditto)	BROUGHTON, 1876.
Betula lenta, Willd. (bark)	PROCTER, 1844.
Polygala Senega, L. (root)	LANGBECK, 1881.
" *alba* (root)	REUTER, 1889.
" *vulgaris* (root)	BOURQUELOT, 1894.
" *depressa*, Wender. (root)	
" *calcarea*, F. Schulz (root)	
Monotropa hypopitys (stalk)	
Laurus Bzoi n (bark)	SCHIMMEL & CO., 1885.
Spiræa Ulmaria, L. (flowers)	SCHNEEGANS and GEROCK, 1892."

Ed. Kremers and Martha M. James[13] contribute an article on the occurrence of methyl salicylate, and pains have been taken to inquire into the plants referred to by the different authors. They state that "*Betula lenta*, L., supplies at least the large bulk of natural methyl salicylate of commerce." "That *Betula alba*, L., yields methyl salicylate apparently has not been proven." A distillation of the twigs of *Benzoin Benzoin* (L.), Coulter, collected in the fall did not yield the authors any methyl salicylate. The authors also bring together the literature showing that methyl salicylate has been obtained by various authors from the following plants: *Erythroxylon coca*, Lam., and *E. Bolivianum*;[14] *Polygala Senega* L.,[15] *P. Senega*, L., *var. latifolia*, Torrey and

[8] *Amer. Med. Bot*, II, p. 28, Boston, 1818.
[9] *Rep. f. d. Pharm.*, 1834, p. 337; see also Procter, AMER. JOUR. PHARM., 1842, p. 211.
[10] *Semi-Annual Report of Schimmel & Co.*, April, 1895, p. 73.
[11] *Comptes rendus*, CXIX, p. 802.
[12] "Probably identical with *G. punctata*, Blume."
[13] *Pharm. Review*, 1898, p. 100.
[14] *Schimmel's Report*, 1895 (Oct.), p. 50.
[15] Langbeck, in *Pharm. Zeit.*, 1881, p. 261.

Gray;[16] *P. Baldwinii*, Nutt;[17] *P. variabilis*, H. B. K. *albi flora*, D. C.;[18] *P. oleifera*, Heckel;[18] *P. javana*, D. C.;[18] *P. serpillacea*, Weihe (syn. *P. depressa*, Warden; probably *P. depressa*, Wenderoth, of Bourquelot[19]); *P. calcarea*, F. Schulz;[19] *P. vulgaris*, L. Under the genera Gaultheria is mentioned, besides *G. procumbens*, L., *G. fragrantissima*, Wall, (syn. *G. punctata*, Blume, and *G. Leschenaultii*, D. C., the supposition is advanced that *A. Leschenaultii* of Broughton [20] is identical with *G. fragrantissima*), *G. punctata*,[21] and *G. leucocarpa*, Blume.[22]

According to a still more recent investigator,[23] methyl salicylate is found in still other plants. Mention is made of this ester as occurring in a large number of plants of the following natural orders, Leguminoseæ, Sapindaceæ, Euphorbiaceæ, Aurantiaceæ, Bixineæ, Oleaceæ, Rubiaceæ and Polygalaceæ, as also proven to exist in the Jasmineæ, Cupuliferæ, Myrtaceæ, Rosaceæ, Tiliaceæ, Rhamneæ, Erythroxyleæ and Gramineæ. The most methyl salicylate was found in *Abrus precatoria*, which yielded 28 milligrammes per kilo, and the least was found in *Briedelia lanceolata* (N. O. Euphorbiaceæ), which yielded 1·36 per mille. Among the plants found to contain methyl salicylate were *Coffea liberica* and *C. arabica*.

The interest in these investigations is only beginning. The results will be of great value and interest to the botanist and chemist, as well as the pharmacist. The literature must be sifted, the observations confirmed and the peculiar conditions understood under which the formation of methyl salicylate is made possible before we can do more with the material at command. It is possible that when these observations are completed that they will be found to possess important systematic value, and have also a physiological significance in the study of plants.

REVIEWS AND BIBLIOGRAPHICAL NOTICES.

AN ILLUSTRATED FLORA OF THE NORTHERN UNITED STATES, CANADA AND THE BRITISH POSSESSIONS, from Newfoundland to the parallel of the southern boundary of Virginia, and from the Atlantic Ocean westward to the 102d meridian. By Nathaniel Lord Britton, Ph.D., and Hon. Addison Brown. Vol. III.

Volumes I and II have already been reviewed in the AMERICAN JOURNAL OF PHARMACY, November, 1896, p. 630, and August, 1897, p. 428. The concluding volume of this important contribution to American botany has just been issued. It treats twenty-eight families, from Apocynaceæ to Compositæ, in the sequence of Engler and Prantl. As this includes the more important and largely repre-

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[16] Reuter, in *Arch. der Pharm.*, CCXXVII, p. 309. See also Lloyd's paper in *Pharm. Rund.*, VII, p. 86; Karl Mohr, *ibid*, p. 191, and Maisch, *ibid*, p. 236.

[17] H. C. C. Maisch, in AMER. JOUR. PHARM., LXII, p. 484.

[18] Romburgh in *Schimmel's Report*, Oct., 1895, p. 50.

[19] *Comptes rendus*, CXIX, p. 802.

[20] J. Broughton, in *Pharm. Jour. Trans.* [3], XI, p. 281.

[21] *Berichte*, XII, p. 246.

[22] Koehler, *Comptes rendus*, CXIX, p. 802.

[23] *Nederl. Tijdschr. voor Pharm.*, p. 1, through *Pharm. Zeit.*, 1898, p. 304.

sented families of Gamopetalæ, the most difficult of our North American Phanerogams for determination, the appearance of Volume III has been awaited by the student of systematic botany, to decide many of the problems of determination that are continually puzzling the plant collector.

As in the former volumes, Dr. Britton has received the assistance of specialists in certain groups, as, for example, in the Solanaceæ the descriptions of the genus Physalis have been contributed by Mr. P. A. Ryberg. The recent determinations of special students have likewise been accepted, and, as a result, throughout the book there is a marked tendency to recognize as distinct species many recognized forms which the older botanists were prone to consider merely as varieties.

The intent to determine the exact limitations of families and genera is apparent, and as a result of this critical labor numerous changes are noted, as, for example, the asters of the Eastern United States are now classed under three genera—Aster, Doellingeria and Ionactis.

The stupendous labor of the authors is attested by the fact that, in less than two years, the three volumes have been published, describing and illustrating 4,162 distinct species, including all species now recognized as occurring in the territory covered.

The illustrations, in most cases, are good representations of the plants. The "dodders" serve as an example of their value. In some cases we wish that they had been more extensive. In such small illustrations as the character of the work necessitated, it is probably impossible to show both the characteristic basal and stem leaves of the asters, but as the involucral scales are described as distinguishing characters, they should be figured in *each* species. The omission of explanatory notes to the figures has been carried through the entire volumes.

Many of our old friends are dubbed with new binomials, and this will require an effort to know them by their new names. Some of these changes are interesting to pharmacists, as affecting the source of our Materia Medica and indicating the probable changes in the next revision of the Pharmacopœia. Spearmint is Mentha spicata L.; Dandelion is Taraxacum Taraxacum (L.), Karst.; "Beech Drops" is Leptamnium Virginianum (L.), Raf.; Fleabane is Leptilon Canadense (L.), Britt., and Culver's Root again becomes Leptandra Virginica (L.), Nutt. The Cypress vine of the garden becomes Quamoclit Quamoclit (L.), Britt, and the Kenilworth Ivy becomes Cymbalaria Cymbalaria (L.), Wettst, and the tomato is Lycopersicon Lycopersicon (L.), Karst. These are but samples of the changes in names.

The uses and economic value of the plants have received very little attention. In a few descriptions commonplace statements that "the leaves are used as salads," or "the root as a substitute for food" occur, but there is no attempt to make this a feature of the volume.

The almost entire absence of references to the medicinal value of plants is another weak spot in the work. The few statements made are of questionable value. On page 101 we are told that the mucilage of the seeds of Salvia Sclarea L. is used to "clear specks from the eye." On page 228 we are told that the "*flowers and fruit of Sambucus Canadensis have strong medicinal properties?*"

There is no mention whatever made of the medicinal value of such plants as

Viburnum opulus L., Viburnum prunifolium L., Valeriana officinalis L., Digitalis purpurea L., Verbascum Thapsus L., Lobelia inflata L., Eupatorium perfoliatum L., Inula Helenium L., Anthemis nobilis L., Matricaria Chamomilla L., Tanacetum vulgare, Artemisia Absinthium L., Tussilago farfara L., Arctium Lappa L., Leptandra Virginica, Nutt, Grindelia squarrosa (Pursh), Dunal., Hyoscyamus niger L., Datura Stramonium L., and a host of other drug-yielding plants. This is to be regretted, as this leading botanical work could readily have been made a valuable aid to the student of materia medica.

The appendix contains descriptions and figures of eighty-one plants, new discoveries or determinations made while the work was in press. It is noted that here the distinguishing characters are printed in italics, and it is regretted that the same plan was not adopted in the body of the work, as it would have been of great assistance in the determination of plants.

The key to the orders and families has been carefully elaborated, and will prove a valuable aid to collectors and students. The indices are complete, and in the English index Judge Brown has carefully compiled all the popular names, and this will add greatly to the interest of the work. Throughout Volume III more attention has been paid to popular or common names than in the preceding volumes. Foreign plants that have become adventitious in certain localities or escaped from cultivation have been introduced in the volume, and not a few of these are plants of medicinal value. In pointing out a few defects, we do not desire to detract from the deserved commendation of the work. The typograpical errors and errata are remarkably few. The style and character of this flora is such that it must serve as a type for future American works on systematic botany. G. M. B.

THE EXTRA PHARMACOPŒIA. Revised in accordance with the "British Pharmacopœia," 1898. By Wm. Martindale. Serotherapy, Organotherapy, Medical References and a Therapeutic Index by W. Wynn Westcott. Ninth edition. Pp. 626. London: H. K. Lewis. 1898.

About three years have elapsed since the publication of the eighth edition of "The Extra Pharmacopœia." The changes in the present edition are due to the publication of the new Pharmacopœia. In addition to this, however, we note the numerous details and references to the use of the newer unofficial remedies. Among these may be mentioned new synthetic compounds having local anæsthetic properties allied to cocaine—eucaine, holocaine and orthoform. The vaso-dilators, erythrol and manitol nitrates, as well as nitroglycerin (trinitrin) and amyl nitrite, have received attention by the authors according to the light of later researches. Compounds of silver, the citrate and lactate, argentol, argonin and protargol, have been introduced to medical practice and noticed in this new edition, as also the use of glycero-phosphoric acid as a nervine tonic; the new bismuth compounds, chlorodyne equivalents, iodoform succedanea, antipyretics and antiseptics for internal and external use. The last group includes chinosol, creosote and guaiacol compounds. The official groups of concentrated infusions, lozenges, pills, ointments and paraffins are also described and commented on. The controversies on hyoscine and scopolamine, and on pilocarpine and pilocarpidine are likewise referred to, as well as euphthalmine—a synthetic compound for producing mydriasis—and urotropine, a solvent of uric acid, designed to assist in its elimination. The work on antitoxins, serums and lymphs has been revised by noting the ex-

tended use of serotherapy and organotherapy, the diagnostic value of mallein and tuberculin, and the Widal test for typhoid fever, and also the use of serums and antitoxins as prophylactics against diphtheria and typhoid. The newer monographs on aloes, calcium compounds, chelidonium, digitalis, compounds of mercury and iron, mustard, opium, orange, rose, mescal buttons and other drugs have been noticed. The therapeutic index has been extended, and now includes a classified list of antidotes to various poisons.

The revolution in the official strength of alcohol is explained by two tables, which will be found of practical utility for the preparation of the "several degrees of dilution." Numerous medical references to medicinal agents have brought the Extra Pharmacopœia up to date. The well-merited reputation of this work for the conciseness of treatment of drugs and preparations and an up-to-date discussion of the same is sustained in the ninth edition. As we have already said (*Amer. Jour. Pharm.*, 1895, p. 338), "the book is a valuable one for reference, not only by those using the British Pharmacopœia, but by every one who prescribes or dispenses medicines."

A LABORATORY GUIDE IN QUALITATIVE CHEMICAL ANALYSIS. By H. L. Wells. New York: John Wiley & Sons; London: Chapman & Hall. 1898.

This is a cloth-bound, octavo volume, intended for students who are to work under the supervision of an instructor. The contents are divided into three parts, to which are appended a list of apparatus and two sets of labels.

Part I covers seventy pages. It is devoted to directions for the detection of the positive inorganic radicals and the inorganic negative radicals. In these directions the author presents a method of instruction which he has developed in teaching the subject. This method consists in having the student apply reagents to labelled solutions of twenty-seven metals and seventeen acids, and in requiring him to determine for himself the results of the operations. An idea of the system may be gained from the following abstract of the directions given the student for the study of the qualitative behaviors of lead and of its detection in a solution containing soluble salts of lead, silver and mercurous mercury: Find, by experiment, which of the twenty-seven solutions of the metals gives precipitates when a few drops of hydrochloric acid are added. To learn the process of analysis, take separately in small beakers portions of the three solutions which give precipitates with hydrochloric acid, and in another beaker make a mixture of about the same quantity of these solutions. Label the beakers accurately, and in all subsequent operations take care that no mistakes in the identity of the substances are made. To each of the four solutions add hydrochloric acid, filter off the precipitates, wash them with boiling water, and to the filtrate from the mixed chlorides add dilute sulphuric acid. Find which of the metals has given the reaction by adding sulphuric acid in the same way to the filtrates from the separate chlorides. The recognition of silver and mercurous mercury is then directed to be undertaken in a similar manner.

By means of this method, the author aims to obviate thoughtless and mechanical work on the part of the student, and to develop in him the powers of observation, inductive reasoning and memory. The thirty pages of Part II explain the formation of formulas and equations, and some other points of theory which have a special bearing upon the course of study, including the subject of ionization.

Part III occupies fifty-two pages. It consists of an alphabetical arrangement

of the radicals, with brief descriptions of the properties upon which the analytical methods are based.

The point to be decided in regard to this book is whether it is adapted to the needs of a beginner in the study of qualitative analysis. We don't believe it is altogether so adapted; the plan of analysis, as given, is too cumbersome for a beginner, who should be given but one solution for analysis at a time. We think, however, this plan could be simplified for the student and the book be made to serve his purpose, by the instructor having him first analyze the mixture to ascertain its behaviors, and afterwards the separate solutions, one at a time, to enable the student to determine the substances causing these behaviors. The beginner's mind would then be freer to observe, not being haunted by the possibility of getting his materials mixed. But, even then, if we were to put this plan of analysis in his hands, with the object of developing in him the power of observation, we would withhold Part III, for the author has given in this section the very things he wants the student to observe for himself while working according to Part I. The average student would not be long in discovering that these things could be found here, even in the absence of the author's suggestion that he confirm his own observations by consulting this part of the book, and, having put the temptation before him, we would not be surprised to find this student turning leaves and reading instead of folding filters and plodding. J. C. P.

A Short Course in Inorganic Qualitative Analysis for Engineering Students. By J. S. C. Wells, Ph.D., Instructor in Analytical Chemistry, Columbia University, New York: John Wiley & Sons. 1898. 12mo. x + 294 pp.

In preparing this work the author has followed the general plan of Fresenius, but with the idea, as he states, of presenting only that which seemed essential to a clear understanding of the subject and to make it as concise as possible. For this reason he has omitted all but the more important reactions of the different metals and acids, these also being limited in number to those more commonly considered.

The author is evidently impressed with the importance of the study of reactions, for not only are the individual reactions of the members of the different groups considered, but in the introduction to the book considerable space is devoted to this subject, and, in addition, the schemes for separation are accompanied by tables of scheme reactions, these latter making clear to the student the effect of each reagent added to a solution.

Altogether, the work seems well adapted for its purpose, and we believe that it will be found a valuable guide, not only to engineering students, but to others who wish to take a practical course in qualitative analysis but who have not the time to devote to a more elaborate study of the subject. F. Y.

Arbeiten der Kommission des Deutschen Apotheker—Vereins zur Bearbeitung des Arznerbuches. In this work of the Committee on Revision of the German Pharmacopœia we find a number of alterations and additions suggested. Some changes in solubility in alcohol of ammoniac and benzoin are given. The characteristic nervature of folia stramonii is described. Then, also, additions or changes in the tests for acidum agaricinum, aloe, euphorbium, kali causticum fusum, santonin, sebum salicylatum, spiritus

æthereus, tinctura digitalis and zinc salts, etc. Under strophanthus the microchemical test with sulphuric acid is recommended.

BULLETIN OF THE DEPARTMENT OF LABOR. No. 16, May, 1898. Edited by C. D. Wright and Oren W. Weaver, Washington, Government Printing Office.

The major portion of this number contains trustworthy information relating to the opportunities for remunerative employment of American labor and capital in the Yukon Valley and adjoining territory. A number of excellent maps accompany the report.

RECHERCHES CHIMIQUES SUR LES QUINQUINAS. par MM. Pelletier et Caventou: Lues à l'Académie des Sciences le 11 Septembre, 1820. Réimpression des Annales de Chimie et de Physique. T. 15 (1820), pp. 289.

This is a reprint, issued by Dr. J. E. De Vrij, of the chemical researches on quinine by Pelletier and Caventou, who gave to the world the results of their studies on this alkaloid, and to whom it is proposed to erect a monument in front of the École de Pharmacie de Paris.

PHARMACEUTICAL FORMULAS. Collated chiefly from *The Chemist and Druggist* and "The Chemists' and Duggists' Diaries." By Peter MacEwan. Pp. 664. Price 8s., post free. London: *The Chemist and Druggist*, 42 Cannon Street.

This is a book of useful recipes for the drug trade, and comprises formulas for toilet preparations and specialties, preparations for the hair, dentifrices, perfumes, household and culinary requisites, antiseptics and disinfectants, inks, varnishes, confectionery, medicinal compounds, and many other preparations related to the art of pharmacy. "One feature of the book is that the contents are, in a great measure, based upon requests for more than a generation of pharmacists for assistance in supplying articles for which they could discover no recognized formulas." "The information so collated has been, as far as possible, checked by experiment and reference to the original sources and supplemented by private formulas which have been abundantly proved in practice." To provide for great differences in tastes, a great many different formulæ of the same preparation are given. The editor does not claim that all the formulæ will work under all conditions, but says this with regard to formula failures: "Many a man says a formula is bad when his ingredients are at fault. Weak lime-water does not emulsify like freshly-prepared aqua calcis; hard paraffin has not all the properties of beeswax, nor does a geranium-loaded otto of rose give the delightful aroma of the real thing. Such deviations may not always be the cause of failure, but they often have something to do with it, and manipulation has more." The formulas published in this work have been selected and in many cases tried. The information contained in this volume will more than repay the practical pharmacist in having it in his possession.

UNTERSUCHUNG IN DER ZUMMTSÄUREREIHE. By Hermann Kunz-Krause. Reprint from *Ber. d. D. Chem. Ges.*, xxxi, Heft. 8.

The author has investigated the appearance of fluorescence, which occurs by the action of metallic sodium on cumarole and some other derivatives of cumarin.

TRANSACTIONS OF THE ACADEMY OF SCIENCE OF ST. LOUIS. Reprints on the following topics have been received:

An Unusual Phyto-Benzoar By Wm. Trelease. (See AMER. JOUR. PHARM., 1898, p. 52.)

The Trees of St. Louis, as Influenced by the Tornado of 1896. By Hermann von Schrenk. The author enumerates some of the phenomena which followed the period of destruction of the tornado which swept over the southern part of St. Louis on May 27, 1896. "There was hardly a tree that escaped injury of one kind or another, with the possible exception of several cypresses, *Taxodium distichum*, which, with their conical forms, yielded to the force of the wind. The maples and elms, as stated by Norton, were in many cases uprooted, and when this took place in the first few moments of the greatest wind velocity the trees were simply turned over, and, when straightened up some days after, resumed their former growth, and to-day these trees are almost the only normal trees in the Lafayette Park district." The destruction of foliage was very marked, particularly in such trees as the soft maples and sycamores; several trees of the honey-locust retained most of their leaves. In specimens of maple and sycamore there was observed a double (abnormal) ring in the branches, but not in the trunk; corresponding to observations made by King.

ECOLOGICAL PLANT GEOGRAPHY OF KANSAS. By A. S. Hitchcock.

A CONTRIBUTION TO THE HERPETOLOGY OF MISSOURI. By Julius Hurter.

NEW OR LITTLE KNOWN NORTH AMERICAN BEES. By Charles Robertson.

THE MOLLUSCAN FAUNA OF WESTERN NEW YORK. By Frank Collins Baker.

THE EFFICIENCY OF GEARING UNDER FRICTION. By Calvin M. Woodward.

A METHOD OF MEASURING THE PRESSURE AT ANY POINT IN A STRUCTURE, DUE TO WIND BLOWING AGAINST THAT STRUCTURE. By Francis E. Nipher.

CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY. Reprint from *Proc. Acad. of Arts and Sciences*, May, 1898.

In this reprint is contained a valuable contribution, by B. L. Robinson, on (1) Revision of the North American and Mexican species of Mimosa, and (2) Revision of the North American species of Nepuntia. The work is wholly systematic.

BASIS OF THE SCIENCE OF POLITICAL ECONOMY. By Ed. Atkinson. Reprint from *Proc. Amer. Acad. Arts and Sci.*, March, 1898.

A TABLE OF ATOMIC WEIGHTS. By Theodore William Richards. Reprint from *Proc. Amer. Acad. Arts and Sciences*, May, 1898.

This is a continuation of the work on atomic weights from the chemical laboratory of Harvard College, and will be noted more fully at a later issue of this JOURNAL.

L'ORGANO-TERAPIA NELLE NEFRITI DELLA INFANZIA. Per il Prof. Luigi Concetti. Estratto dal *Bull. R. Acad. Med. di Roma*, 1897–98. Fasc. 1.

ROYAL BOTANIC GARDENS, TRINIDAD. Annual report for the year 1897, by J. H. Hart, Superintendent. Trinidad: Printed at the Government Printing Office, Port-of-Spain, 1898.

The report indicates progress in every line. A number of plants meriting distinct specific rank have been discovered. Among others, a large illustration of the new African coffee (*Coffea stenophylla*, G. Don) is given. The trees in Trinidad are four years old and have fruited this year for the first time. "It gives promise of becoming an abundant bearer, and its product is of a quality to give it a place at once upon the markets as a first-class coffee of the Mocha type of bean." "In growth, in crop, in quality and in facility for preparation it promises to prove a plant of the best class for cultivation in the West Indies." A curious lime-attracting algæ was determined at Kew as *Schizotrix fasiculata*, Gomoul. This algæ attracts to itself large quantities of lime, the incrustations of which are freely apparent to the naked eye.

The experiments in the fermentation of saccharine fluids have been continued, and the various stages of the indigenous or native ferments, or yeasts, have been closely watched. It has been ascertained that the ferments which occur naturally or spontaneously in cane juice or other saccharine fluids are quite distinct in Trinidad from those of the neighboring island of Jamaica. Professor Jorgensen reports that he has separated several distinct species of alcoholic ferments from the material from Trinidad, an account of which will probably be found in the forthcoming revised edition of his valuable work on fermentation. "The importance of work in this direction is better understood when it is stated that it has been found possible to induce certain flavors by using certain ferments in the 'wash,' or material from which rum is distilled, and that the flavor of distilled liquor can in this way be brought under the control of the operator."

KING'S AMERICAN ECLECTIC DISPENSATORY. New edition. Entirely rewritten and enlarged. By Harvey W. Felter, M.D., Adjunct Professor of Chemistry in the Eclectic Medical Institute, Cincinnati, O., and John Uri Lloyd, Ph.M., Professor of Chemistry and Pharmacy in the Eclectic Medical Institute, Cincinnati, O. Two-volume edition, royal octavo, each volume containing over 950 pp., with complete indexes. Cloth, $4.50 per volume, post-paid. Sheep, $5.00 per volume, post-paid. Advance subscriptions received by the Scudder Brothers Co., No. 1009 Plum Street, Cincinnati, O., General Agents.

The following catalogues and announcements have been received:

CATALOGUE OF THE UNIVERSITY OF PENNSYLVANIA. 1897–98.

ALBANY COLLEGE OF PHARMACY. Catalogue, 1897–98. Announcement, 1898–99.

BUFFALO COLLEGE OF PHARMACY. Thirteenth Annual Announcement, 1898–99.

THE BROOKLYN COLLEGE OF PHARMACY. Eighth Annual Announcement. Session of 1898–99.

NORTHWESTERN UNIVERSITY SCHOOL OF PHARMACY. Circular of Information for Session 1898–99.

UNIVERSITY OF IOWA (DEPARTMENT OF PHARMACY). Announcement for 1898–99.

COLLEGE OF PHARMACY OF THE CITY OF NEW YORK. Prospectus for session of 1898–99.

CLEVELAND SCHOOL OF PHARMACY. Seventeenth Annual Announcement, session of 1898–99.

MASSACHUSETTS COLLEGE OF PHARMACY. Thirty-second Annual Catalogue, 1898–99.

THE UNIVERSITY OF MINNESOTA. Bulletin of the College of Pharmacy, June 30, 1898.

CHICAGO COLLEGE OF PHARMACY. The School of Pharmacy of the University of Illinois. Thirty-ninth Annual Announcement.

PRICE LIST OF SHARP & DOHME.

AMERICAN PHARMACEUTICAL ASSOCIATION.

A program of the Forty-sixth Annual Meeting, to be held in Baltimore, August 29 to September 12, 1898, has been issued by the Local Committee, and includes list of hotels with rates, and partial list of Baltimore's attractions and directory of points of interest. Headquarters will be at Lehmann's Hall, 856 N. Howard Street, Baltimore.

The Reception Committee proposes to meet all incoming trains and will escort visitors to their respective hotels. Any one missed by the committee should take Maryland Avenue cars direct to Lehmann's Hall.

OFFICIAL PROGRAM.

Authorized by the Council.

Monday, August 29th.

11.00 A.M. Meeting of Council.
3.00 P.M. First General Session.
8.30 P.M. Reception of visiting members, delegates and ladies, to be followed by concert and hop.

Tuesday, August 30th.

10.00 A.M. Second General Session.
4.00 P.M. Carriage ride to points of interest and through Druid Hill Park.
8.00 P.M. Meeting of Commercial Section.

Wednesday, August 31st.

10.30 A.M. All day ride on the Chesapeake, including visit to Naval Academy and historical rooms of the State House at Annapolis. Meals to be served *en route*.

Thursday, September 1st.

10.00 A.M. First Session of Scientific Section.
3.00 P.M. Second Session of Scientific Section.
8.00 P.M. Third Session of Scientific Section.

Friday, September 2d.

10.00 A.M. First Session of Educational and Legislative Section.
3.00 P.M. Second Session of Educational and Legislative Section.
7.00 P.M. Trolley-car ride through city and to Entertainment at Electric Park.

Saturday, September 3d.

10.00 A.M. Third Session of Educational and Legislative Section.

3.00 P.M. Third General Session.

Social features to be complimentary, tendered visiting members, delegates and ladies by drug trade of Baltimore.

PROPOSED SUBSCRIPTION EXCURSIONS.

Monday, September 5th.

To Gettysburg Battlefield and Blue Ridge Mountains.

Tuesday, September 6th.

To Washington and Mount Vernon.

HOTELS.

NOTE.—Parties wishing to secure hotel accommodations are earnestly requested to notify Local Secretary, Henry P. Hynson, 423 N. Charles Street, Baltimore, Md., as early as possible, stating house preferred, number, location, style and price of rooms desired, as near as may be.

OBITUARY.

Mitchell G. Rosengarten, a member of the firm of Rosengarten & Sons, died on the morning of May 19, 1898, at his residence, 1826 Spruce Street, Philadelphia.

He was the second son of the late George D. Rosengarten, a native of Germany, who came to this city in 1819, and in 1822 established the chemical industry still carried on by his sons and grandsons.

The elder Mr. Rosengarten died in 1890, leaving five sons, four of whom continue the business, the fifth son being a member of the Philadelphia Bar.

The subject of this sketch was born in Philadelphia, on September 10, 1829; he was educated at the school of Thomas D. James, and subsequently attended the lectures of the Philadelphia College of Pharmacy. He studied chemistry under the late James C. Booth and Martin Boyé, in their private laboratory.

After working for five years in his father's laboratory, Mr. Rosengarten became a member of the firm, which then took the name of Rosengarten & Sons, an elder brother, Mr. S. G. Rosengarten, being admitted to the firm at the same time.

Mr. Rosengarten took an active part in the business, made several journeys abroad, and was frequently present at the meetings of different pharmaceutical and chemical associations in this country.

He was married to Miss Emily Huntsman, of Flushing, N. Y., and leaves three sons and two daughters.

Mr. Rosengarten was a member of the Union League, American Pharmaceutical Association, Philadelphia College of Pharmacy, Franklin Institute and other organizations.

Mr. Rosengarten, although living very quietly, was well known for his charities and many acts of kindness. He had a large acquaintance with the members of the drug trade and the pharmacists and chemists at home and

abroad, and his death called forth many expressions of regret and sympathy for his family and his firm.

He was a useful citizen and served cheerfully in every capacity in which he was called on. His kindly nature and warm sympathy made him very popular, both in his own business world and with a large circle of friends, by all of whom his death is greatly felt.

NOTES AND NEWS.

Silva of North America.—The eleventh volume of the "Silva of North America," by Charles Sprague Sargent, has appeared, and is devoted to the genus Pinus. Thirty-four species are described. The genus has representatives in all parts of eastern North America, except the basin of the Central Mississippi and the elevated plains east of the Rocky Mountains.

High Per Cent. of Quinine.—A hybrid of Cinchona Calisaya Ledgeriana and Cinchona Succirubra, 20 years old, raised in the gardens of the Government cinchona plantations at Java, from seed, contained the highest amount of quinine yet on record. This remarkable tree yielded 14·13 per cent. quinine sulphate. The report says that this is calculated on "air-dry" bark, a not over accurate statement, since it cannot now be compared to the other analyses, which are figured at 105° C. Cuttings of this tree, brought upon the market, were sold for about $4.00 apiece.—*Excerpt from a letter from J. B. Nagelvoort, June, 1898.*

The First Nathan Lewis Hatfield Prize for Original Research in Medicine.—The College of Physicians of Philadelphia announces through its Committee that the sum of $500 will be awarded to the author of the best essay in competition for the above prize.

SUBJECT: "A Pathological and Clinical Study of the Thymus Gland and its Relations."

Essays must be submitted on or before January 1, 1900.

Each essay must be typewritten, designated by a motto or device, and accompanied by a sealed envelope bearing the same motto or device, and containing the name and address of the author. No envelope will be opened except that which accompanies the successful essay.

The committee will return the unsuccessful essays if reclaimed by their respective writers or their agents within one year.

The committee reserve the right not to make an award if no essay submitted is considered worthy of the prize.

The treatment of the subject must, in accordance with the conditions of the trust, embody original observations, or researches, or original deductions.

The competition shall be open to members of the medical profession and men of science in the United States.

The original of the successful essay shall become the property of the College of Physicians.

The Trustees shall have full control of the publication of the memorial essay. It shall be published in the Transactions of the College, and also, when expedient, as a separate issue.

Address, J. C. Wilson, M.D., Chairman, College of Physicians, 219 South Thirteenth Street, Philadelphia, Pa.